DRAFT FINAL
RCRA FACILITY INVESTIGATION WORK PLAN
LANDFILL 4 (FTC-008/SWMU 4)
FORT CARSON, COLORADO

Contract No. DACW45-94-D0001
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Prepared for:
U.S. Army Corps of Engineers
Omaha District

Prepared by:
Earth Tech Environment & Infrastructure, Inc.
Englewood, Colorado

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LIST OF ABBREVIATIONS AND ACRONYMS

ASTM	American Society for Testing and Materials
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CDPHE	Colorado Department of Public Health and Environment
CMQAL	Chemical and Materials Quality Assurance Laboratory
CMS	Corrective Measures Study
COC	Chain of Custody
DECAM	Directorate of Environmental Compliance and Management
DOT	Department of Transportation
DQO	data quality objective
DRMO	Defense Reutilization Marketing Office
Earth Tech	Earth Tech Environment & Infrastructure, Inc.
EPA	Environmental Protection Agency
FLPM	Field and Laboratory Procedures Manual
Fort Carson	Fort Carson Military Reservation
IDW	Investigation-Derived Waste
LIMS	Laboratory Information Management System
MS/MSD	matrix spike/matrix spike duplicate
NMOC	non-methane organic compound
Paragon	Paragon Analytics, Inc.
Part B Permit	RCRA Hazardous Waste Part B Permit No. CO-95-09-29-03
PID	photoionization detector
POL	petroleum, oil, and lubricants
PPE	Personal Protective Equipment
PSHM	Project Safety and Health Manager
PSSHP	Programmatic Site Safety and Health Plan
QA	quality assurance
QC	quality control
QGMP	Quarterly Groundwater Monitoring Program
PCB	polychlorinated biphenyls
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
Rust	Rust Environment & Infrastructure
SAP	Sampling and Analysis Plan

LIST OF ABBREVIATIONS AND ACRONYMS
(Continued)

USCS	Unified Soil Classification System
UTL	upper tolerance limit
VOC	volatile organic compound
Work Plan	RFI Work Plan

1.0 INTRODUCTION

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan addresses Landfill 4 (FTC-008) located at the northwest corner of the Cantonment Area, Fort Carson, Colorado. This RFI Work Plan was prepared as required by the RCRA Hazardous Waste Part B Permit No. CO-95-09-29-03 (Part B Permit) (Colorado Department of Public Health and Environment [CDPHE] 1995) issued to Fort Carson Military Reservation (Fort Carson). The Part B Permit designates Landfill 4 as Solid Waste Management Unit (SWMU) 4. Data generated from the work described in this plan will be summarized in an RFI report and used to prepare a Corrective Measures Study (CMS) report. The RFI is being conducted for the U.S. Army Corps of Engineers (USACE), Omaha District, under Contract Number DACW45-94-D001, Delivery Order Number 19.

This RFI Work Plan (Work Plan) includes both a Field Sampling and Analysis Plan (SAP) and a Site-Specific Safety and Health Plan (SSHP). The SAP describes the site-specific operations and procedures to be followed by Earth Tech Environment & Infrastructure (Earth Tech) and its subcontractors in conducting the Landfill 4 RFI. The overall field and laboratory procedures to be followed during the RFI are described in the Fort Carson Field and Laboratory Procedures Manual (FLPM) (Rust 1997). The SSHP is appended to this Work Plan as Appendix A and includes site-specific safety and health procedures to be implemented during the field work. General safety and health procedures are described in the Fort Carson Programmatic Site Safety and Health Plan (PSSHP) (Rust 1995).

2.0 PROJECT DESCRIPTION

2.1 PROJECT OBJECTIVE

The objective of this RFI Work Plan is to define the field activities required to characterize soil and groundwater at Landfill 4 and provide sufficient detail to support a CMS. The soil and groundwater at Landfill 4 will be investigated as required by Section IV.G.1.d of the Part B Permit. The results of this field work will be used to evaluate the site and, if necessary, to design and implement an interim or corrective action plan. Specifically, the objectives of the field and laboratory investigations described in this Work Plan are to:

- Determine if landfill gas is being generated and migrating away from the site,
- Determine if chemicals from the landfill have impacted shallow groundwater at the site,
- Characterize organic layer found 4 to 10 feet below ground surface (bgs),
- Construct an accurate water table map using existing wells and installing new permanent monitoring wells, and
- Confirm the landfill boundary by construction of additional test pits.

The location of Landfill 4 and the delineation of site boundaries were previously established by excavating trenches in the area suspected as the landfill as discussed in Section 2.4.2. These excavation activities allowed the landfill material to be visually observed to determine physical properties and thickness. No soil cover was seen during trench excavation, which eliminated the need to evaluate the existing landfill cover. In addition, surface water/sediment samples were taken of the landfill drainage at the adjacent B Ditch. Soil gas sampling will be used to determine if gas is migrating away from the site, and groundwater monitoring wells will be installed both upgradient

2.2 SITE LOCATION AND DESCRIPTION

Fort Carson is located approximately 8 miles south of Colorado Springs and occupies more than 220 square miles, predominantly in El Paso County. Fort Carson is an active military training installation for both weapons qualification and field training. The primary mission of Fort Carson is the training and preparation of all assigned and attached troops to ensure combat-readiness. Principal industrial operations at Fort Carson are vehicle and aircraft repair and maintenance.

Landfill 4 is located in the northwest corner of the Cantonment Area, bordered by B Ditch to the west and south and Specker Avenue to the east. Currently, the Defense Reutilization Marketing Office (DRMO) storage yard and Buildings 326 and 327 are located and operate on the abandoned landfill. The approximate location of Landfill 4 is shown on Figure 2-1.

2.3 SITE HISTORY

Historical records indicate that Landfill 4 was excavated into the Piney Creek alluvium and operated for about six months in 1957 to receive sanitary wastes and possibly small amounts of sludge and waste petroleum, oil, and lubricants (POL). A shallow groundwater table forced the landfill to be abandoned.

A review of aerial photographs was performed for Landfill 4. Available photographs include July 1947 (single photo), June 1953 (single photo), September 1957 (partial stereo), June 1967 (single paper copy) and April 1970 (single photo). The 1947 photograph shows the Landfill 4 site bordered on the west and south by a ditch, and a road that pre-dates Specker Avenue bordering the east side of the site. There appears to be some ground disturbance on the east side of the ditch, but no evidence of landfill activities. There may also be some ground disturbance west of the ditch that is close to, and appears associated with, the former Northern POW area in the northwest corner of the

for a dirt path to a minimally disturbed area. The 1957 photo shows further ground disturbance in the Landfill 4 area (east of the ditch only). There appears to be a darker area in the southwest portion of the site. In addition, the dirt path noted in the 1953 photo (located west of the ditch) now turns to the east and cuts across the ditch, through the southwest portion of Landfill 4 (through the middle of the darker area on the photo), and intersects with Specker Avenue. As seen in stereo viewing for a majority of the site, there does not appear to be any debris or surface disposal activities at this site. The 1967 photo shows similar conditions, however, there appears to be several items staged in the Landfill 4 area (east of the ditch only). The 1970 photo shows the presence of six structures on the Landfill 4 site (east of the ditch only). There is no evidence of ground disturbance to the west, and the dirt road noted in the previous two photos has been mostly vegetated over.

2.4 PREVIOUS INVESTIGATIONS

Previous investigations at the suspected Landfill 4 site include soil boring construction, monitoring well installation, trenching, and surface water/sediment sampling. Soil boring construction and monitoring well installation occurred as separate investigations over several years (Rust 1999a), while trenching was completed as discussed in the Final Letter Work Plan for Landfills 4, 10, and 11, (Rust 1998). Surface water/sediment sampling occurred as part of the Landfill 4 soil excavation for construction of the general purpose warehouse (Rust 1999b).

2.4.1 Monitoring Well Installation

Seven groundwater monitoring wells (LF4MW1, LF4MW2, LF4MW3, W4-1, W4-2, W4-3, and PZ4) have existed in the area of Landfill 4. Monitoring well construction information can be found in Table 2-1. All wells lie in the possible landfill area with the exception of LF4MW3 to the north and W4-3 to the east (see Figure 2-2). Wells LF4MW2, LF4MW3, and W4-3 have been sampled under recent Quarterly Groundwater Monitoring Program (QGMP) sampling, and these samples

as sample results from existing wells W4-1, W4-2, W4-3, and PZ4. Water levels were recorded for several wells, and depth to groundwater ranged from 3 feet to 13 feet below the top of the well casing and indicates a southeastern flow direction at the site.

During the installation of well LF4MW1, black staining in the fractures of bedrock was noted from 7.5 to 10 feet bgs. At approximately 4 feet bgs, there was an elevated headspace reading of 43.0 ppm. No headspace reading was taken any lower in the soil boring. No analytical samples were collected during the installation of the wells. At this time further subsurface soil investigation is merited to examine the elevated headspace readings and black staining.

2.4.2 Trenching

Trenches were excavated in August 1998 as part of the Final Letter Work Plan. Originally, 12 trench locations were proposed based on historical information and field observations of variations in the natural topography. As discussed in the Final Letter Work Plan, the objective was to define landfill boundaries to the west and east of B Ditch, and in the drainage ditch located between the DRMO storage yard and Specker Avenue. If landfill material were encountered in this drainage ditch, trenching would continue east of Specker Avenue. The majority of the objective was accomplished with the construction of 19 trenches, as shown on Figure 2-3. Trench lengths varied from 5 to 100 feet. Trenching followed the procedures set forth in the FLPM. Equipment used for this work included a photoionization detector (PID) and an LEL/O2/H2S multigas meter. During excavation, field screening detected no volatile organic vapors or H2S.

A field log was prepared for each trench. It described the length, width, depth, and orientation of each trench and all materials encountered (see Appendix B, Test Pit Reports). The lithology of most of the trenches can be described as fill material overlying a silt layer. Excavation depths ranged

Debris was found near the surface with no soil cover in place. Trenching activities ceased once debris was identified.

A 6-inch to 1-foot layer of black decaying organic matter was located 4 to 10 feet bgs in several of the trenches (Figure 2-4). Figure 2-4 shows the locations of trenches where landfill material or black organic layer existed, as well as well LF4MW1 which had elevated headspace readings. The black organic layer was not sampled in the trenching investigation as it was thought to represent a former soil horizon. Further trenching, sampling and analytical investigations will be performed to characterize the organic layer and confirm the landfill boundaries.

After surveying the trench locations, the initial landfill boundary (based on debris) was delineated, as shown on Figure 2-4. The trenches containing debris were used to place the footprint of the landfill directly under the asphalt of the DRMO. The debris thickness found in LF4TP09 increased as trenching continued north to the asphalt. Debris was seen again north of the asphalt in LF4TP15. No debris was found east or west of the asphalt, placing the landfill initially directly underneath the asphalt between LF4TP09 and LF4TP15, a total area of about 2.5 acres. This area is a conservative estimate because trenches were not excavated in the asphalt.

During the construction (November 1999) of a general warehouse (Building 320) north of the outlined landfill area, additional landfill material was encountered and excavated (see Appendix C for photos). This suggests the boundary extends further north and east. Soil gas monitoring will be performed along the south and east sides of the new building to monitor for potential landfill gases.

2.4.3 Soil Borings

Four soil borings were introduced in the area of Landfill 4 during January 1995. They are LF4SB01,

after sampling was complete. The only organic compounds detected above the practical quantitation limit (PQL) in any of the soil samples were di-n-butyl phthalate and bis (2-ethylhexyl) phthalate. Phthalates are common plasticizers frequently found as laboratory contaminants. The inorganic analytes above assessment criteria include: cadmium (LF4SB03, 4 to 5 feet bgs, and LF4SB04, 4 to 5 feet bgs); and mercury (LF4SB04 0 to 1 foot and 4 to 5 feet bgs). The detected concentrations of these analytes only slightly exceeded the upper tolerance limits (UTLs). The sample results are found in Table 2-3.

2.4.4 Surface Water/Sediment Sampling

Surface water and sediment samples were collected in June 1999 for characterization. Three sample sites were selected along B Ditch in the Landfill 4 drainage (see Figure 2-2). A surface water and sediment sample were collected from each site. Water and soil samples were analyzed for volatile and semivolatile organics as well as metals. Surface water samples contained background levels of inorganics with no detections of organics. Sediment samples for the three sites contained metals at concentrations below background levels; however, LF4SD02 and LF4SD03 sediment samples also had detections below reporting limits of benzene, toluene, ethylbenzene, and xylenes (BTEX) and LF4SD01 (upgradient of the site) contained 1,2-dichlorobenzene below reporting limits.

The drainage was channelized in November 2000 for surface water improvements. During this activity, no trash was observed along the channel sideslopes. The material that was observed along the sideslopes consisted of reworked weathered Pierre Shale as fill material. The observed water in the ditch was approximately 5 feet bgs.

3.0 PROJECT ORGANIZATION AND SCHEDULE

3.1 EARTH TECH PROJECT ORGANIZATION AND QUALITY CONTROL

The Chief Project Manager, Project Manager, Task Manager, and Field Manager are directly responsible for projects operations, including implementation of quality control (QC) procedures. The Program Manager monitors the overall project for compliance with established Quality Assurance (QA)/QC procedures. QA is also provided by independent senior staff reviewers, personnel who are not responsible for daily project operations but have the authority to ensure that project quality objectives are achieved. In this manner, the authority to ensure quality is independent from the responsibility for project operations so that integrity is maintained for both project operations and QA.

3.2 PROJECT TEAM

The Program Manager, Mr. John Shaler, is responsible for coordinating and managing the Total Environmental Restoration Contract. The focal point of the Project Team is the Chief Project Manager, Mr. John England, who is responsible for the overall coordination and successful completion of all project activities, both administrative and technical. Mr. England is also the primary Earth Tech contact with the USACE and Fort Carson. Ms. Caroline Whitesides is the Project Manager for Fort Carson investigation activities. She will coordinate this investigation with other investigation activities at Fort Carson. Ms. Whitesides will also provide senior review as well as ensure that quality objectives are achieved.

As Project Geologist for this project, Ms. Lindsay Groom will provide daily project coordination and supervision. Ms. Groom was directly involved in developing this Work Plan and will be directly involved in implementing field activities and evaluating data.

work is conducted. The Field Manager will ensure that personnel assisting with field activities follow the procedures presented in this Work Plan.

The Project Safety and Health Manager (PSHM) is Mr. John Visty, who is responsible for implementing the project SSHP and for monitoring the project for compliance with SSHP requirements. The PSHM is alerted when site conditions that might require modifications to the SSHP field operating procedures are encountered. Mr. Visty will conduct site visits and audit field operations to monitor compliance with SSHP requirements. Mr. Jon Kaibel will also serve as the Site Safety and Health Officer (SSHO) for this work.

Paragon Analytics, Inc. (Paragon) of Fort Collins, Colorado, was selected as the off-site, fixed- base laboratory for groundwater sample analysis. Paragon is a USACE-validated laboratory for water, sediment, and soil matrices. Paragon has an open-ended interim validation. The laboratory contact is Mr. Ken Campbell. Another laboratory (to be determined) will analyze gas samples collected for the RFI.

3.3 QUALITY ASSURANCE

Quality is the responsibility of the entire project team. The Project Manager has ultimate responsibility for the quality of all work products generated by the project team. Additional QA will be provided by a senior staff member who will review all technical work products, including project plans, data validation, and analysis reports, to ensure technical adequacy, editorial clarity, and adherence to accepted practices and standards. As Project Manager for RFI activities, Ms. Caroline Whitesides will provide QA reviews. Because of her familiarity with the overall requirements of this work, Ms. Whitesides will also serve as a technical resource for project personnel. Mr. Tom Henderson will be an independent Senior Technical Reviewer to ensure that the quality objectives

reduction, validation, reporting, and performance system audits. Specifications are given in this Work Plan if they differ from the general procedures.

4.0 FIELD SAMPLING AND ANALYSIS PLAN

This section of the Work Plan provides an overview of the field SAP and describes the site-specific sampling locations, procedures, and analytical requirements for the Landfill 4 investigation. General field procedures are described in the FLPM. The results of field activities will be validated, evaluated, and presented in an RFI report. Information in the RFI report will be used to develop the CMS or to support an interim corrective measure.

4.1 OVERVIEW OF FIELD SAMPLING AND ANALYSIS PLAN

Field sampling and analysis consists of a two-phase approach. The first phase, already completed, involved confirming the presence of landfill material (Section 2.4.2). Originally, the second phase was to determine the thickness, physical properties, and effectiveness of the landfill cover. However, landfill material was found to be underneath an asphalt parking lot during trenching activities, which eliminated the need for soil sampling to characterize the soil cover. Therefore, the second phase will involve determining if the material within the landfill has affected the surface or groundwater quality, if landfill gas is being generated and migrating away from the landfill, and further delineation of the landfill boundaries. Surface water/sediment samples have already been collected, as discussed in Section 2.4.3. The following types of activities will occur to complete the phased investigation:

- Site clearance to identify underground utilities or obstructions,
- Soil gas sampling to determine if landfill gas and/or VOCs are present and if they are migrating away from the site,
- Groundwater monitoring well installations and sample collection and analysis from these new wells to investigate potential impacts to groundwater from the landfill,

4.2 DATA QUALITY OBJECTIVES

The field investigation will include soil gas, groundwater, and soil sampling. The data quality objectives (DQOs) presented in the FLPM will be used to evaluate field data. The DQOs were defined for remedial investigation projects with the primary purpose of determining the nature and extent of site-related chemicals. The DQOs present the precision, accuracy, representiveness, comparability, and completeness requirements for the data. In addition, the following project-specific data levels were established.

- **Soil Gas Sampling (Screening Level Data).** Soil gas samples will be collected from shallow soils or below the asphalt pavement to determine if landfill gas is migrating away from the site. Soil gas samples will be analyzed first for organic vapor, methane, hydrogen sulfide, carbon dioxide, oxygen, LEL, and pressure using portable field instruments. Samples with organic vapor detections will be sent to an off-site laboratory and analyzed using U.S. Environmental Protection Agency (EPA) Method TO14 for determining Toxic Organic Compounds in Ambient Air. Samples with methane or carbon dioxide detections will be analyzed using EPA Method 3C for the determination of methane, carbon dioxide, nitrogen, and oxygen.

- **Groundwater Sampling (Screening Level Data).** Groundwater samples will be collected from temporary monitoring wells installed in six soil borings to further characterize the groundwater in the Landfill 4 area. Groundwater samples from the temporary wells will be analyzed for VOCs, semivolatile organic compounds (SVOCs), and metals in accordance with the Part B Permit requirements in Section IV.G.1.i. The results will be used to distinguish the nature and extent of contamination and characterize investigation-derived waste (IDW) for disposal. The groundwater samples will be analyzed using the methods listed in Table 4-1 and the method reporting limits provided in the FLPM. The samples will be analyzed at an off-site, fixed-base laboratory. The methods provide reporting limits that are generally sufficient to characterize groundwater based on Colorado Ground Water Standards and federal Maximum Contaminant Levels and to compare with RCRA characteristic waste criteria to evaluate IDW disposal options.

- **Groundwater Sampling (Definitive Level Data).** New monitoring wells will be installed and sampled to determine if shallow groundwater is present and to investigate potential

Colorado Ground Water Standards and federal Maximum Contaminant Levels and to compare with RCRA characteristic waste criteria to evaluate IDW disposal options.

- **Soil Sampling (Definitive Level Data).** One soil sample from each monitoring well and soil boring will be analyzed for VOCs, SVOCs, and metals using the analytical methods listed in Table 4-1. The methods selected provide adequate detection limits to compare the results with TCLP. The results will provide definitive level data for waste characterization and identification of the organic layer. The samples will be analyzed at an off-site, fixed-base laboratory using the method detection limits provided in the FLPM.

4.3 SITE CLEARANCE

Prior to soil gas sampling and monitoring well installation, the Dig Permit Office will be contacted to clear for underground utilities and structures (Leslie Jacobs, [719] 526-3089). The Dig Permit Office will mark the locations of subsurface utilities on the pavement, concrete, or ground surface. In addition, a site visit will be performed with Earth Tech and a Directorate of Environmental Compliance and Management (DECAM) representative to establish sampling locations.

4.4 SOIL GAS SAMPLING

Active soil gas sampling will be conducted at Landfill 4 to assess the presence of pressure and gases generated from waste decomposition and to screen for potential organic contaminants in the wastes. A pressure meter will be used to evaluate the pressure within the soil gas sampling probe prior to collection of soil gas samples. A multigas meter will be used to analyze soil gas samples for: methane, LEL, H2S, oxygen, and carbon dioxide. A PID will be used to analyze soil gas samples for organic vapors. A total of 22 points will be installed (as shown on Figure 4-1). Nine points will be installed within the landfill boundary to cover the landfill area (2.5 acres). Thirteen points will be installed outside the landfill boundaries; four will be installed around the landfill foot print, eight will be installed on the west side of B Ditch, and one will be installed on the south side of Building 320. Of the seven to be installed west of the ditch, four will be installed at former trench locations

To obtain a sample both inside and outside of the landfill, the post driver method will be used to penetrate landfill materials. Temporary gas sampling rods will be installed in the vadose zone in accordance with 40 Code of Federal Regulations (CFR) Part 60, Appendix A, Method 25C. Each probe will consist of a pre-cleaned 5.25-foot long by 0.38-inch outside diameter steel sampling rod. The sampling rod will be pushed to a depth not less than 3 feet then lifted no more than one-half of a foot to create a void space. The samples will be gathered at least 4 feet bgs up to 10 feet bgs, if possible, to coincide with a black organic layer noted throughout parts of the study area. Each sample rod will be sealed at the ground surface with hydrated bentonite to ensure a good seal between the soil and the sample rods. After the sample rods are sealed in place, a Teflon cover will be placed on top of the rods to prevent ambient air from entering the rods or subsurface vapors from escaping. Sampling points that may interfere with DRMO activities will be marked adequately.

The sample rods will be left undisturbed for 24 hours to ensure the bentonite has fully hydrated and that the subsurface vapors exposed to the sample rod have equilibrated between the sample rod and the soil. Then the probe rods will be analyzed for the parameters noted above. If organic vapors are detected, a sample will be collected and submitted to an off-site laboratory for EPA Method T014. If methane, carbon dioxide, or hydrogen sulfide are detected, a sample will be collected and submitted to an off-site laboratory for EPA Method 3C. These laboratory samples will be collected by first evacuating the void space within the sample rod four or more times using a personal pump. After the rod void volume is purged, a SUMMA™ canister provided by the analytical laboratory will be attached to each sample rod. SUMMA™ canisters are small stainless steel sample vessels under 30 inches of mercury vacuum. A landfill gas sample will then be collected by opening the regulator/valve on the SUMMA™ canister, allowing landfill gas to fill the evacuated canister. The regulator attached to the canister will control the flow rate of the landfill gas and typically will be used to allow the canister to fill at a rate of 500 milliliters per minute. Once collected, the containers

4.5 GROUNDWATER EVALUATION

Eight groundwater monitoring wells are located in the vicinity of Landfill 4. LF4MW2, LF4MW3, and W4-3 were sampled during recent Fort Carson QGMP and analyzed for VOCs, inorganics, alkalinity, nitrate/nitrite, and total organic carbon, as discussed in Section 2.4.1. These wells are installed in alluvium, and water levels indicate that shallow groundwater is present in the vicinity of the landfill (Table 4-1). Presently, none of the wells fully evaluate upgradient groundwater conditions. Therefore, one new well will be installed (upgradient) to collect data on groundwater occurrence, flow direction, and chemical quality (see Figure 4-2). A second well will be installed to replace PZ4, a 1.5-inch diameter well with a 2-foot screen. Groundwater was collected from this well only twice, during the Landfill 4 RFI in 1995 and during the QGMP in 2000. There were detections of vinyl chloride in groundwater exceeding regulations during both rounds of sampling. Confirmation groundwater samples will be collected from the new monitoring well that will be installed with a 10-foot screen adjacent to PZ4. Additionally, six temporary wells will be completed in soil borings, and used for groundwater sampling and additional groundwater elevations. In addition, development and sampling will be performed on existing wells at the site, not installed by Earth Tech. These wells include W4-1, W4-2, and W4-3. Monitoring wells LF4MW1, LF4MW2, and LF4MW3 will also be sampled for this RFI.

4.5.1 Monitoring Wells

Prior to drilling new permanent monitoring wells LF4MW4 and LF4MW5, drilling permits for the State of Colorado and Fort Carson will be secured and complied with. These wells will be installed regardless of whether or not groundwater is encountered during drilling to allow any soils with low permeability to equalize in the well over time. It is anticipated that the wells will be screened in the alluvium; however, the wells will be drilled into the unweathered Pierre Shale if water is not encountered above the bedrock contact.

collected at 5-foot intervals for headspace screening and potential laboratory analysis. The wells will be completed above ground. Well construction methods are detailed in Section 2.4 of the FLPM. For the three wells already installed at Landfill 4 (LF4MW1, LF4MW2, and LF4MW3) the filter pack only extended to 1 foot above the top of the screen due to shallow water tables and limited completion zones. This deviation from the FLPM may be required for new wells and will not affect the quality of the water sampled from these wells. The augers, drilling tools, and all down hole equipment will be decontaminated between use at each well location in accordance with the procedures identified in Section 2.15 of the FLPM. The decontamination fluids will be placed in new U.S. Department of Transportation (DOT)-approved 55-gallon drums and handled as discussed in Section 5.5. It is anticipated that two soil samples from each monitoring well will be submitted for chemical analysis as shown in Table 4-2. These samples will be collected from the most impacted sample interval or from the interval immediately above the water table for waste characterization, and the bottom of the boring for evaluation of the potential impact limits. Headspace screening or visual observation will be used to determine the most impacted sample. Field headspace screening will be conducted with a PID following the procedures outlined in Section 2.3 of the FLPM. Additional soil samples will be submitted for laboratory analysis if multiple zones of elevated headspace readings or staining are detected.

Well development will be conducted no sooner than 48 hours after well completion and within one week of completion. The wells will be developed by mechanically surging and bailing in accordance with the procedures described in Section 2.4 of the FLPM. Sampling will be performed no sooner than two weeks after well development. Prior to each sampling event, the wells will be purged of a minimum of three casing volumes using pumps or bailers, as described in Section 2.5 of the FLPM. If the well is purged dry, the well will be allowed to recover for 24 hours prior to sample collection. Groundwater samples will be collected using disposable polyethylene bailers

4.5.2 Groundwater Analysis

Groundwater samples will be collected from the three new monitoring wells and analyzed for VOCs, SVOCs, and metals using the methods specified in Table 4-2. In addition, a preserved VOC sample will be collected and submitted for analyses by Method 8021 to evaluate the potential presence of aromatic hydrocarbons. Groundwater samples collected for dissolved metal analysis will be field filtered by passing the sample through a disposable 0.45-micron filter. The groundwater samples will be submitted to Paragon, an off-site fixed-base laboratory, for analysis. Groundwater samples collected from existing monitoring wells will be analyzed for the same parameters.

Based on past pesticide and herbicide disposal practices at Fort Carson, these constituents are not reasonably expected to be encountered in the groundwater. Past practices at Fort Carson include returning unused pesticide/herbicide to the manufacturer, rinsing empty containers prior to disposal, and treating decontamination fluids in the Fort Carson Industrial Wastewater Treatment Plant.

The following QA/QC samples will be collected for groundwater according to the QA/QC sample collection procedures outlined in Section 3.10 of the FLPM: trip blanks, field duplicates, matrix spike (MS), and matrix spike duplicates (MSDs). One trip blank will be included in each cooler of VOC groundwater samples submitted to the laboratory. One field duplicate will be taken as well as one MS/MSD set. MS/MSD laboratory analytical procedures are addressed in Section 3.9 of the FLPM.

4.6 SOIL BORING/TEMPORARY GROUNDWATER MONITORING WELLS

Four soil borings (LF4SB01, LF4SB02, LF4SB03, and LF4SB04) were installed in linear section through the centerline of the landfill, mainly around the new and existing buildings, east of B Ditch during RFI activities at Landfill 4 in January 1995. All soil borings were sampled at two intervals

temporary well. Elevated headspace readings were noted at 4 feet bgs in the LF4MW1 installation. There was black staining noted in the fractures of bedrock from 7.5 to 10 feet bgs, however no soil samples were taken during the well installation. Two soil borings (LF4DP02 and LF4DP04) will be placed upgradient and downgradient of PZ4 (to be removed) and LF4MW5 (replacement well) and will be completed as temporary wells. The final three soil borings will be located on the west side of the B Ditch and converted into temporary groundwater wells. The temporary wells will be used to obtain a grab sample for groundwater analysis and measure water levels for a more accurate water level map.

4.6.1 Soil Borings

Six soil borings will be constructed utilizing a truck-mounted direct push drilling rig. The drilling will be conducted using 1.5-inch outside diameter direct push drilling rods to allow for the installation of temporary monitoring wells. Soil samples will be collected continuously for lithologic description during drilling. Additional samples will collected at each sample interval (typically 4 feet) for headspace screening and potential laboratory analysis. The borehole will be advanced until the bottom of the black organic layer is noted (anticipated depth up to 10 feet) or until groundwater is encountered (anticipated depth of 5 to 10 feet).

4.6.2 Soil Analysis

Soil samples will be collected for laboratory analysis from the black organic material interval or from the interval that displays the highest field headspace results. If there is no black organic layer or headspace screening results indicate no VOCs, then the sample will be collected from immediately above the water table interface. In addition, a soil sample will be collected from the bottom of each boring where the black organic layer or other impacted material are encountered. A soil sample will be collected from within the 7.5 to 10-foot interval of the direct push boring

4.6.3 Temporary Groundwater Wells

Temporary monitoring wells will be constructed in all of the direct push borings. The screens will be placed to bracket the water table interface. The monitoring well screens will be constructed of 1-inch inside diameter, flush threaded, schedule 40, machine slotted, PVC. The screen slot opening will be 0.010-inch and the maximum length of the screen will be 10 feet. All PVC well screen and riser sections will be rinsed with clean water prior to being placed in the ground unless they arrive at the site factory wrapped. The monitoring wells will be constructed as temporary above ground installations with a bentonite seal to prevent surface water from entering the boring.

The direct push rods, drilling tools, and all down hole equipment will be decontaminated between use at each soil boring location in accordance with the procedures identified in Section 2.15 of the FLPM. The decontamination fluids and drill cuttings will be placed in new U.S. DOT-approved 55-gallon drums and handled as discussed in Section 5.5.

Groundwater will be sampled utilizing a 0.75-inch outer diameter (OD) disposable bailer. Sampling procedures will be termed as a grab sampling technique. Groundwater quality parameters will not be collected. Only the required volume for analysis will be collected.

4.6.4 Groundwater Analysis

Groundwater samples will be collected from all temporary wells and analyzed for VOCs, SVOCs, and metals using the methods specified in Table 4-1. In addition, a preserved VOC sample will be collected and submitted for analyses by Method 8021 to evaluate for the potential presence of aromatic hydrocarbons. Groundwater samples collected for dissolved metal analysis will be field filtered by passing the sample through a disposable 0.45-micron filter. The groundwater samples will be submitted to Paragon, an off-site fixed-base laboratory, for analysis.

4.7 TRENCHING

Trenching was performed to create 19 test pits in August 1998 for determining landfill boundaries. A black organic layer was noted in nine of the test pits, mostly west of the B Ditch. However, the black material was not sampled. Further test pit investigation is needed to evaluate the nature and extent of the black organic layer and confirm the proposed landfill boundary in the southwest area of the site.

extent of the black organic layer and confirm the proposed landfill boundary in the southwest area of the site.

Four test pits (LF4TP20, LF4TP21, LF4TP22, and LF4TP23) will be constructed (west and southwest of the B Ditch) to accomplish the objectives noted above (Figure 4-3). Test pits will be excavated by removing soil in 6-inch to 1-foot lifts to maximum depths of approximately 8 feet bgs. Each backhoe bucket of removed material will be visually assessed for the presence of landfill materials. The test pits will be backfilled immediately if waste materials are encountered. All excavated materials will be placed on plastic sheeting and will be used to backfill the excavation. If the black material layer is encountered, a sample of that material will be collected for laboratory analysis of VOCs, SVOCs, and metals.

Test pit excavation progress will be logged on a test pit form to document subsurface conditions. The form will describe the length, width, depth, and orientation of each trench and materials encountered.

4.8 SURVEYING

Surveying of existing monitoring wells, newly installed permanent monitoring, and temporary wells will be performed by a registered surveyor in the State of Colorado in accordance with the FLPM. In addition, building corners for Building 320 and the existing General Purpose Warehouse, as well as test pit positions, will be surveyed for accurate portrayal on the figures. A Global Positioning System will be utilized to determine the horizontal coordinates of all wells, trench positions (ends of long axes), and building corners. The survey coordinates will be referenced to the North American Datum of 1983 and the Colorado State Plane Coordinate System, and the elevations will be referenced to the National Adjusted Vertical Datum of 1988. Traditional surveying techniques

4.9 HAZARD ASSESSMENT

Various hazards exist that may be encountered by Earth Tech and subcontractor personnel during field activities at Landfill 4. These hazards include potential exposure to chemicals in air, groundwater, and soils as well as physical hazards such as fire, noise, weather conditions, heavy equipment and motor vehicles, and ergonomic hazards associated with drilling and trenching activities. The health and safety procedures developed to minimize these hazards are described in the SSHP and the PSSHP. These procedures will be followed by all on-site personnel during field activities. The SSHP is included in Appendix A.

5.0 GENERAL FIELD MANAGEMENT PROCEDURES

5.1 SOURCE WATER

Fort Carson personnel will identify an approved on-site source for the source water used in equipment decontamination, borehole grouting, and well drilling, if required. This water must be sampled and analyzed to ensure that the water supply is not tainted and, therefore, will not affect investigation results. Source water samples from Building 1304 near the intersection of Wetzel and Ellis Streets, from Building 9246 near Butts Army Airfield, and from the Fort Carson Earth Tech trailer have been collected and analyzed for VOCs (EPA Method 8260), SVOCs (EPA Method 8270), and metals (EPA Methods 6010 and 7000 series) as part of the Fort Carson QGMP using procedures described in the FLPM. If water from a source other than these two locations is used, sampling must be conducted for these same parameters prior to its use. Otherwise, no new source water samples will be collected for this RFI.

5.2 DECONTAMINATION PROCEDURES

Equipment decontamination will take place immediately adjacent to Landfill 4. Decontamination will be conducted such that fluids used for decontamination are containerized after use. The drill rig will be decontaminated prior to arrival on site. It is anticipated that the actual drill rig (not its drilling and sampling components) will not come into direct contact with the soils; therefore, the drilling company will be required to decontaminate the rig off site at their own cost. Larger equipment such as augers and all down hole tools used for drilling and soil sampling will be decontaminated between boring locations using pressurized hot water from a steam cleaner or similar device. All equipment will be decontaminated on a mobile decontamination rig to facilitate decontamination fluid containerization. Smaller sampling equipment such as split spoon samplers, bailers, and water level probes will be decontaminated before each sample is collected in accordance

5.3 FIELD WORK DOCUMENTATION

All field activities will be thoroughly documented using forms and procedures described in Section 4.0 of the FLPM. In general, details of Landfill 4 field activities will be logged on the forms included in the FLPM; however, specially developed forms may also be used. The forms that may be used include:

- Facilities Engineering Work Clearance Request;
- Daily QC Report;
- Daily Activity Log;
- Test Pit Report;
- Soil Sample Collection Log;
- Soil Gas Sampling Log;
- Monitoring Well Completion Log;
- Well Development Record;
- Daily Water Level Summary;
- Groundwater Sample Collection Log; and
- Chain of Custody (COC) Form.

5.4 SAMPLE DESIGNATION

Each soil and groundwater sample will be labeled with a unique location identification. This location identifier will have the three components described below.

- **Site Identification:** A three character code will identify the site. The code to be used for this investigation is "LF4 - Landfill 4".

- **Sample Type Identifier:** A two-character code will identify the type of sample location. The codes to be used for this investigation are:

  SG - Active Soil Gas
  MW - Monitoring Well
  DP – Direct Push (soil boring/temporary monitoring well)
  TP - Test Pit

Soil Gas	Monitoring Wells	Soil Borings	Test Pits
LF4SG01	LF4MW4	LF4DP01	LF4TP20
LF4SG02	LF4MW5	LF4DP02	LF4TP21
etc.	etc.	etc.	etc.

Individual sample depths and quality control identifications (for duplicate and MS/MSD) will be maintained in a separate field within the data table for each unique location identifier. Each analytical sample will also be assigned a unique sequential number on the COC. Sample labeling, handling, and shipping will be conducted in accordance with procedures outlined in Section 2.13 of the FLPM.

5.5 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Four separate waste streams will be generated from soil and groundwater sampling. The waste streams include: investigation-derived soil cuttings, monitoring well development and purge water, decontamination water, and personal protective equipment (PPE). The IDW will be segregated and containerized in new or recycled, DOT-approved 55-gallon drums labeled as IDW pending the results of analyses. The drums will be labeled and stored as described in Section 2.13 of the FLPM. IDW management will be performed in accordance with CDPHE's IDW Management Policy.

Each waste stream will be placed in separate 55-gallon drums for each sampling location, except for decontamination fluids and PPE. Decontamination fluids and PPE will not be containerized discretely for each sampling point. Discrete soil samples of the most impacted interval (based on visual observations and field headspace screening) will be used for characterizing IDW for each individual boring. Soil cuttings from monitoring well borings will be drummed and disposal alternatives evaluated based on soil analysis results. Soil cuttings will be monitored with a PID to evaluate headspace.

Wastewater System. Waste streams not meeting these criteria will be shipped to an off-site facility for disposal.

5.6 FIELD EQUIPMENT PREVENTIVE MAINTENANCE AND CALIBRATION PROCEDURES

Field equipment calibration and maintenance will be performed in accordance with manufacturers instructions and the procedures outlined in Section 2.5 of the FLPM. Prior to using the equipment, it will be checked to ensure that it has been maintained and is in working order. While using the equipment in the field, care will be taken to maintain the equipment at its optimum operating ability.

6.0 REPORTING REQUIREMENTS

A variety of reports will be prepared throughout the project to document project activities and facilitate communications among USACE, Fort Carson, CDPHE, and Earth Tech. Field activities will be documented daily using appropriate field forms and summarized in the daily QC report. A project schedule and Monthly Progress Report will be submitted by the Project Manager with each request for payment. Conference notes will be prepared by Earth Tech to document project meetings. Additional submittals will include an Analytical Data Package, a Quality Control Summary Report, and an RFI report. A CMS will be prepared using data from the RFI report and an interim action may be proposed. Each of these submittals is described in the following sections.

6.1 DAILY QUALITY CONTROL REPORT

A daily QC report will be faxed to the USACE Project Geologist daily as field activities are performed. This report will document field measurements, sample collection and management procedures, the number and type of samples collected from each medium, and the number of QC samples obtained. Calibration and maintenance of field instruments will also be reported. Deviations from standard operating procedures and corrective actions taken will be documented in the daily QC report and the Project Manager will be notified immediately. Daily QC reports will be compiled and mailed to the USACE Technical Manager and the DECAM Remedial Program Manager weekly.

6.2 MONTHLY PROGRESS REPORT

Each month, Earth Tech will submit a progress report to the USACE Technical Manager identifying accomplishments and the status of project tasks and describing problems encountered and corrective actions associated with the project. The progress report will be submitted to the USACE Technical

6.3 ANALYTICAL DATA PACKAGE

The analytical data package will contain a compilation of all field sample analytical results, the results of all laboratory and field QC analyses, and all COC documentation. Raw data, including calibration data and chromatography will not be included. A cover letter will indicate the Chemical and Materials Quality Assurance Laboratory (CMQAL) Laboratory Information Management System (LIMS) identification number for this project and that the data are complete for review by the CMQAL. A project-specific LIMS number will be established before field work begins. The LIMS number will be included on the COC for QA samples and on any correspondence to the CMQAL. Complete analytical data packages with narratives from the contract laboratory describing any problems revealed by the internal QC results will be included. The data evaluation prepared by Earth Tech will not be included in the analytical data package, but will be included in the Quality Control Summary Report discussed below.

The analytical data package will be submitted within 30 calendar days after the contract laboratory has submitted the analytical results. The package will be transmitted to the USACE Technical Manager and the DECAM Remedial Program Manager. The CMQAL data package will be mailed to the USACE Technical Manager for transmittal to the laboratory.

6.4 QUALITY CONTROL SUMMARY REPORT

After field activities are completed, daily QC reports will be compiled and summarized in the Quality Control Summary Report. This report will outline QC practices employed by Earth Tech and will include a discussion of any problems encountered and corrective actions taken during field activities. Any modification to the scope of work or procedures presented in this Work Plan will be discussed in terms of potential impacts on DQOs.

- Comparison of surrogate recoveries to laboratory control limits;
- Comparison of method blank analyses to associated sample results;
- Summary of laboratory control issues and their resolution (i.e., MS/MSD results outside control limits, dilutions or interferences necessitating increased detection limits, etc.); and
- Comparison of CMQAL results with contract laboratory results (if CMQAL split samples are analyzed and CMQAL results are provided).

In addition, holding times and overall completeness of the data packages received from the contract laboratory will be evaluated. Tables will be used in the report for ease of presentation. Results of the evaluation will be used to determine data usability and impacts on the DQOs.

6.5 RFI REPORT

The RFI report will include a data summary from the field investigation. A risk evaluation may be included. EPA guidelines for developing an RFI report will be reviewed during report preparation. The RFI report will be prepared in draft for submittal to the USACE Technical Manager and the Fort Carson Remedial Program Manager. Following receipt of comments from those reviewers, edits addressing the comments will be incorporated and a draft final report will be prepared. The Draft Final RFI Report will be submitted as replacement pages to draft report recipients. A full copy of the Draft Final RFI Report will be submitted to the CDPHE within 90 days of completing the RFI field activities.

6.5.1 RFI Data Summary

The RFI report will include a description of sampling methods and will present analytical data results from the field investigation. Data will be evaluated and the nature and extent of contamination identified will be presented. Site sampling results will be compared to background

will be discussed. Recommendations for no further action, additional data collection, initiation of interim action, or CMS initiation will be provided.

6.5.2 Risk-Based Evaluation

Colorado Ground Water Standards, Colorado Drinking Water Regulations, Colorado Surface Water Standards, and Federal Drinking Water Regulations (Maximum Contaminant Levels) will be used to evaluate groundwater potentially affected by past site operations. Where available, water quality standards will be compared to detected concentrations in samples collected as part of site investigation activities. For constituents with no water quality standard, it may be necessary to evaluate the potential risk to human and ecological receptors associated with the concentrations of constituents detected during sampling activities. Attainment of appropriate and applicable water quality standards will be demonstrated through the corrective action procedures (where needed) and closure processes.

Pursuant to the guidance set forth in the Interim Final Policy and Guidance on Risk Assessment for Corrective Action at RCRA Facilities (CDPHE 1993), inorganic constituent concentrations will be compared to background concentrations as the first screening step. Site-specific data sets for inorganic constituent background concentrations have been prepared for soils and groundwater media at Fort Carson. These data will be used to evaluate inorganic constituent concentrations detected during sampling activities.

Since regulatory standards are not available for soils, risk-based levels have been developed to evaluate impacts to soils. The Interim Final Policy and Guidance on Risk Assessment for Corrective Action at RCRA Facilities will be used to determine if constituent concentrations detected in soils are above (a) background concentrations; (b) risk-based screening levels for potential human

standards. Any risk evaluation conducted will be consistent with the guidance set forth in the Interim Final Policy and Guidance on Risk Assessment for Corrective Action at RCRA Facilities (CDPHE 1993) and the Risk Assessment Guidance for Superfund (RAGS) (EPA 1989).

6.6 CORRECTIVE MEASURES STUDY

The CMS is designed to identify and evaluate potential corrective action alternatives and to recommend corrective measures for potential releases to soil and groundwater that have been identified at Fort Carson. Based on the results of the site investigations, a CMS may be warranted. The CMS, if required, will identify, screen, and develop corrective action alternatives for the site.

The CMS will include the following minimum requirements.

- Summarization of RFI conclusions, including additional information obtained since the site investigation was completed;
- Identification of additional data needs;
- Establishment of corrective action objectives;
- Identification and screening of corrective action technologies;
- Development and evaluation of corrective action measure alternatives; and
- Justification and recommendation of the corrective measure.

Because treatment of landfill waste material is generally impractical, the CMS will focus on containment as the appropriate corrective measure. The CMS will include an evaluation of a new landfill cover and measures to minimize landfill leachate generation and control landfill gas. Measures to control landfill leachate or contaminated groundwater will be evaluated as warranted.

asphalt, Matcon, is being considered for the interim cover. However, the evaluation is pending more data from pilot test sites. If the interim action is implemented, the CMS will evaluate cap effectiveness and the need for additional action to control leachate migration and address groundwater contamination.

6.7 SCHEDULE

The proposed schedule for the RFI activities is presented on Figure 6-1. The schedule extends from initiation of field activities through the submittal of the investigation results in the form of an RFI report. The field sampling program will be initiated within 45 days of CDPHE approval of this plan. Laboratory analytical data are expected to be available within 30 days after completing field activities. The Draft RFI Report will be completed and submitted to USACE and Fort Carson approximately 60 days after field activities are completed. The Draft Final RFI Report will be submitted to the agencies 90 days after field activities are completed, and will be followed by a CDPHE review and comment period. The Final RFI Report will be submitted 30 days after CDPHE comments on the Draft Final RFI Report are received. CDPHE review periods are estimated on Figure 6-1.

A schedule for CMS preparation will be prepared after the data generated during the field activities covered by this Work Plan are reviewed. If groundwater contamination is encountered at the landfill, an interim corrective measure such as landfill containment may be initiated. The duration of interim activities is not included on the schedule.

7.0 REFERENCES

Colorado Department of Public Health and Environment (CDPHE). 1993. *Interim Final Policy and Guidance on Risk Assessment for Corrective Action at RCRA Facilities*.

CDPHE. 1995. State RCRA Permit, Fort Carson, Permit No. CO-95-09-29-03, September 29.

Environmental Protection Agency. 1989. *Interim Final Policy and Guidance on Risk Assessment for Corrective Action at RCRA Facilities and the Risk Assessment Guidance for Superfund (RAGS).*

Rust Environment & Infrastructure (Rust). 1995. P*rogrammatic Site Safety and Health Plan, Fort Carson, Colorado.* November.

Rust. 1997. *Field and Laboratory Procedures Manual, Revision 2, Fort Carson, Colorado*. April.

Rust. 1998. *Final Letter Work Plan for Landfills 4, 10, and 11, Revision 1, Fort Carson, Colorado.*

Rust. 1999a. *Draft Final RCRA Facility Investigation Report for Group A Sites, Fort Carson, Colorado*. June

Rust. 1999b. *Soil Excavated From West of Landfill 4, Fort Carson, Colorado, Serial Letter No. TERC1-19-0197 RD*. June.

TABLES

TABLE 2-1
MONITORING WELL CONSTRUCTION SUMMARY INFORMATION
LANDFILL 4
FORT CARSON, COLORADO

Well ID	Ground Surface Elevation[1]	Inner Riser Stick Up Height (feet)	Screen Length[2]	Well Casing Inside Diameter (inches)[2]	TOC Elevation[1]	Depth Measured from TOC (feet)		
						Total Depth[2]	Depth to Screen[2]	Depth to Water[4]
New Wells:								
LF4MW1	5875.9	2.43	10	2	5878.33	17.62	7.43	3.48
LF4MW2	5876.8	2.55	10	2	5879.37	17.89	7.55	9.54
LF4MW3	5872.7	2.16	10	2	5875.08	17.56	7.16	5.51
Existing Wells[5]:								
W4-1	5874.7	2.75	10	2	5877.57	18.18	7.75	6.09
W4-2	5872.7	2.6	10	2	5875.31	20.13	10.27	6.67
W4-3	unknown	2.4	20	2	5830(?)	32.81	12	13.67
PZ4	5872.1	0.55	2	1.5	5872.73	11.98	10.25	0.89

Notes:
TOC Top of Casing
[1] Based on survey data.
[2] From Well Completion Detail Log (Appendix F of RFI).
[3] Total depth measured prior to sampling (Ground Water Sample Collection Log found in Appendix I of RFI).
[4] Depth to water measured prior to RFI sampling (Groundwater Sample Collection Log found in Appendix I of RFI).
[5] From USACHPPM (Appendix B of RFI), Phase II, 1995.

TABLE 2-2
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Result	Lab Flag	Validation Flag	Unit	Criteria Value	Criteria Units
Groundwater Monitoring Wells									
LF4MW1	4/25/1995	6010	Antimony	0.0812			mg/L	0.008	mg/L
		6010	Barium	0.0236			mg/L	2	mg/L
		6010	Calcium	509			mg/L	462	mg/L
		6010	Magnesium	104			mg/L	643	mg/L
		6010	Manganese	0.33			mg/L	9.46	mg/L
		6010	Potassium	16			mg/L	29.7	mg/L
		6010	Silver	0.0039	J	J	mg/L	0.05	mg/L
		6010	Sodium	867			mg/L	2140	mg/L
		6010	Thallium	0.0765			mg/L	0.0034	mg/L
LF4MW2	5/3/2000	6010	Calcium	460			mg/L	462	mg/L
		6010	Iron	0.16			mg/L	5.5	mg/L
		6010	Magnesium	160			mg/L	643	mg/L
		6010	Potassium	19			mg/L	29.7	mg/L
		6010	Sodium	530			mg/L	2140	mg/L
	5/4/2000	415.1	Total Organic Carbon	2.7			mg/L	14.1	mg/L
		300.0	Nitrate as N	0.68			mg/L	10	mg/L
		300.0	Sulfate	2600			mg/L	7870	mg/L
		300.0	Chloride	80			mg/L	334	mg/L
		410.4	Chemical Oxygen Demand	15			mg/L	--	
		160.1	Total Dissolved Solids	4300			mg/L	12200	mg/L
		160.2	Total Suspended Solids	88			mg/L	17633	mg/L
LF4MW3	4/29/1998	6010	Calcium	310			mg/L	462	mg/L
		6010	Sodium	490			mg/L	2140	mg/L
		6010	Magnesium	150			mg/L	643	mg/L
		6010	Potassium	7.9			mg/L	29.7	mg/L
		6010	Manganese	0.094			mg/L	9.46	mg/L
		8270	bis(2-Ethylhexyl)phthalate	2.6	J		µg/L	6	µg/L
		340.2	Fluoride	0.9			mg/L	6.43	mg/L
		300.0	Chloride	29			mg/L	334	mg/L
		300.0	Sulfate	1600			mg/L	7870	mg/L
		310.1	Alkalinity, Total as CaCO3 at pH 4.5	540			mg/L	--	
		310.1	Alkalinity, Bicarb. as CaCO3 at pH 4.5	540			mg/L	--	
		300.0	Nitrate as N	2.9			mg/L	10	mg/L
		300.0	Nitrate plus Nitrite as N	2.9			mg/L	10	mg/L
		160.1	Total Dissolved Solids	3000			mg/L	12200	mg/L
		415.1	Total Organic Carbon	9			mg/L	14.1	mg/L
		410.4	Chemical Oxygen Demand	17			mg/L	--	
W4-1	4/27/1995	6010	Antimony	0.0684			mg/L	0.008	mg/L
		6010	Barium	0.012	J	J	mg/L	2	mg/L
		6010	Calcium	476			mg/L	462	mg/L
		6010	Iron	0.1545			mg/L	5.5	mg/L
		6010	Magnesium	313			mg/L	643	mg/L
		6010	Manganese	4.28			mg/L	9.46	mg/L
		6010	Nickel	0.007	J		mg/L	0.1	mg/L

TABLE 2-2
ANALYTES DETECTED IN GROUNDWATER SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Date	Method Number	Analyte	Result	Lab Flag	Validation Flag	Unit	Criteria Value	Criteria Units
		6010	Potassium	2.87			mg/L	29.7	mg/L
W4-1	4/27/1995	6010	Silver	0.0033	J	J	mg/L	0.05	mg/L
(cont.)		6010	Sodium	1420			mg/L	2140	mg/L
W4-2	4/24/1995	6010	Antimony	0.0842			mg/L	0.008	mg/L
		6010	Barium	0.011	J		mg/L	2	mg/L
		6010	Calcium	355			mg/L	462	mg/L
		6010	Magnesium	314			mg/L	643	mg/L
		6010	Manganese	2.84			mg/L	9.46	mg/L
		6010	Potassium	21.1			mg/L	29.7	mg/L
		6010	Sodium	4100			mg/L	2140	mg/L
		6010	Thallium	0.0334			mg/L	0.0034	mg/L
W4-3	7/27/1999	6010	Calcium	380			mg/L	462	mg/L
		6010	Magnesium	250			mg/L	643	mg/L
		6010	Manganese	0.57			mg/L	9.46	mg/L
		6010	Potassium	34			mg/L	29.7	mg/L
		6010	Sodium	2400			mg/L	2140	mg/L
PZ4	5/5/1995	7041	Antimony	0.088	J		mg/L	0.008	mg/L
		6010	Aluminum	0.095	J		mg/L	0.31	mg/L
		6010	Barium	0.0266		J	mg/L	2	mg/L
		6010	Beryllium	0.0004	J		mg/L	0.004	mg/L
		6010	Calcium	447			mg/L	462	mg/L
		6010	Iron	0.456			mg/L	5.5	mg/L
		6010	Magnesium	1.21			mg/L	643	mg/L
		6010	Nickel	0.0461			mg/L	0.1	mg/L
		6010	Potassium	69.6			mg/L	29.7	mg/L
		6010	Silver	0.0032	J	J	mg/L	0.05	mg/L
		8260	Vinyl chloride	4.6			µg/L	2	µg/L
	8/10/2000	8260	Carbon disulfide	0.45	J		µg/L	1000	µg/L
		8260	Vinyl chloride	4.7			µg/L	2	µg/L

Notes:

Shaded concentrations exceed assessment criteria.
All metals samples were field filtered and results are reported as dissolved concentrations.
Volatile organic compound samples (Method 8260) collected in 1995 and 1998 were preserved.
All other VOC samples were unpreserved.

J Analyte was detected at a concentration below the reporting limit or is an estimated concentration.
mg/L milligrams per liter
µg/L micrograms per liter
-- No assessment criteria established for the corresponding analyte.

TABLE 2-3
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Interval (feet)	Geologic Unit	Sample Date	Method Number	Analyte	Result	Lab Flag	Validation Flag	UTL	Unit
Soil Borings										
LF4SB1	4-5	P	1/25/1995	6010	Barium	94.7			573	mg/kg
				6010	Cadmium	0.47	J		0.64	mg/kg
				6010	Chromium	10.6			21.8	mg/kg
				7060	Arsenic	5.8			11.3	mg/kg
				7421	Lead	14.7			27.8	mg/kg
				7471	Mercury	0.034	J		0.0772	mg/kg
LF4SB1	9-10	P	1/25/1995	6010	Barium	189			573	mg/kg
				6010	Cadmium	0.47	J		0.64	mg/kg
				6010	Chromium	12.5			21.8	mg/kg
				6010	Silver	0.45	J		2.8	mg/kg
				7060	Arsenic	5.2			11.3	mg/kg
				7421	Lead	18.9			27.8	mg/kg
LF4SB1DUP	9-10	P	1/25/1995	6010	Barium	178			573	mg/kg
				6010	Cadmium	0.32	J		0.64	mg/kg
				6010	Chromium	9.6			21.8	mg/kg
				6010	Silver	0.41	J		2.8	mg/kg
				7060	Arsenic	4.8			11.3	mg/kg
				7421	Lead	17.9			27.8	mg/kg
				7471	Mercury	0.046	J		0.0772	mg/kg
				8270	Di-n-butylphthalate	340				µg/kg
LF4SB2	4-5	P	1/25/1995	6010	Barium	80.1			573	mg/kg
				6010	Cadmium	0.51			0.64	mg/kg
				6010	Chromium	11.1			21.8	mg/kg
				7060	Arsenic	8.9			11.3	mg/kg
				7421	Lead	21.5			27.8	mg/kg
				7471	Mercury	0.056	J		0.0772	mg/kg
				7740	Selenium	0.51			5.5	mg/kg
LF4SB2	9-10	P	1/25/1995	6010	Barium	74.8		J	573	mg/kg
				6010	Cadmium	0.37	J	J	0.64	mg/kg
				6010	Chromium	10.5		J	21.8	mg/kg
				6010	Silver	0.27	J		2.8	mg/kg
				7060	Arsenic	4		J	11.3	mg/kg
				7421	Lead	28.1		J	27.8	mg/kg
				7471	Mercury	0.072	J		0.0772	mg/kg
				8270	Bis(2-ethylhexyl)phthalate	150	J			µg/kg
LF4SB3	0-1	A	1/25/1995	6010	Barium	44.5			282	mg/kg
				6010	Chromium	5.3			22.1	mg/kg
				6010	Silver	0.22	J		0.73	mg/kg
				7060	Arsenic	3.1			15	mg/kg
				7421	Lead	11.5			32.9	mg/kg

TABLE 2-3
ANALYTES DETECTED IN SOIL SAMPLES
LANDFILL 4
FORT CARSON, COLORADO

Site ID	Sample Interval (feet)	Geologic Unit	Sample Date	Method Number	Analyte	Result	Lab Flag	Validation Flag	UTL	Unit
LF4SB3	4-5	A	1/25/1995	6010	Barium	132			282	mg/kg
				6010	Cadmium	0.86			0.315	mg/kg
				6010	Chromium	12.9			22.1	mg/kg
				7060	Arsenic	5.7			15	mg/kg
				7421	Lead	17.2			32.9	mg/kg
LF4SB4	0-1	A	1/26/1995	6010	Barium	89.9			282	mg/kg
				6010	Chromium	8.8			22.1	mg/kg
				6010	Silver	0.4	J		0.73	mg/kg
				7060	Arsenic	4.1			15	mg/kg
				7421	Lead	13.9			32.9	mg/kg
				7471	Mercury	0.035	J		0.034	mg/kg
				7740	Selenium	0.38	J		3.03	mg/kg
LF4SB4	4-5	A	1/26/1995	6010	Barium	69.9			282	mg/kg
				6010	Cadmium	0.41			0.315	mg/kg
				6010	Chromium	14.7			22.1	mg/kg
				7060	Arsenic	4.2			15	mg/kg
				7421	Lead	14.5			32.9	mg/kg
				7471	Mercury	0.047	J		0.034	mg/kg
				8270	Di-n-butyl phthalate	190	J			µg/kg

Notes:

Shaded concentrations exceed assessment criteria.

mg/kg milligram per kilogram

µg/kg micrograms per kilogram

UTL Upper Tolerance Limit

Geologic Units:

A Alluvium

P Pierre Shale

J Result is detected below the reporting limit or is an estimated concentration.

TABLE 4-1

SUMMARY OF PROPOSED SOIL AND GROUNDWATER ANALYSES[1]

LANDFILL 4

FORT CARSON, COLORADO

Sample Type	Volatile Organic Compounds Method 8260[2]	Semivolatile Organic Compounds Method 8270	Metals Methods 6010[3]/7470[4]/7471[4]	Aromatic Hydrocarbons Method 8021[5]	Total Organic Carbon Method 415.1
Groundwater (2 new wells, 6 temp wells, 6 existing wells)					
Field Sample	14	14	14	14	--
Blanks/Duplicates					
Trip Blank	4	--	--	--	--
Field Duplicate	1	1	1	1	--
Split (CMQAL)	1	1	1	1	--
Trip Blank (CMQAL)	1	--	--	--	--
MS/MSD	1	1	1	1	--
Soil (2 new wells, 6 temp wells, 4 trenches)					
Field Sample	20	20	20	--	5
Duplicates					
Field Duplicate	2	2	2	--	1
Split (CMQAL)	1	1	1	--	1
MS/MSD	1	1	1	--	1

Notes:

CMQAL - Chemical and Materials Quality Assurance Laboratory

MS/MSD - matrix spike/matrix spike duplicate

--

[1] Method detection limits for the individual constituents to be analyzed are provided in the FLPM (Rust 1997).

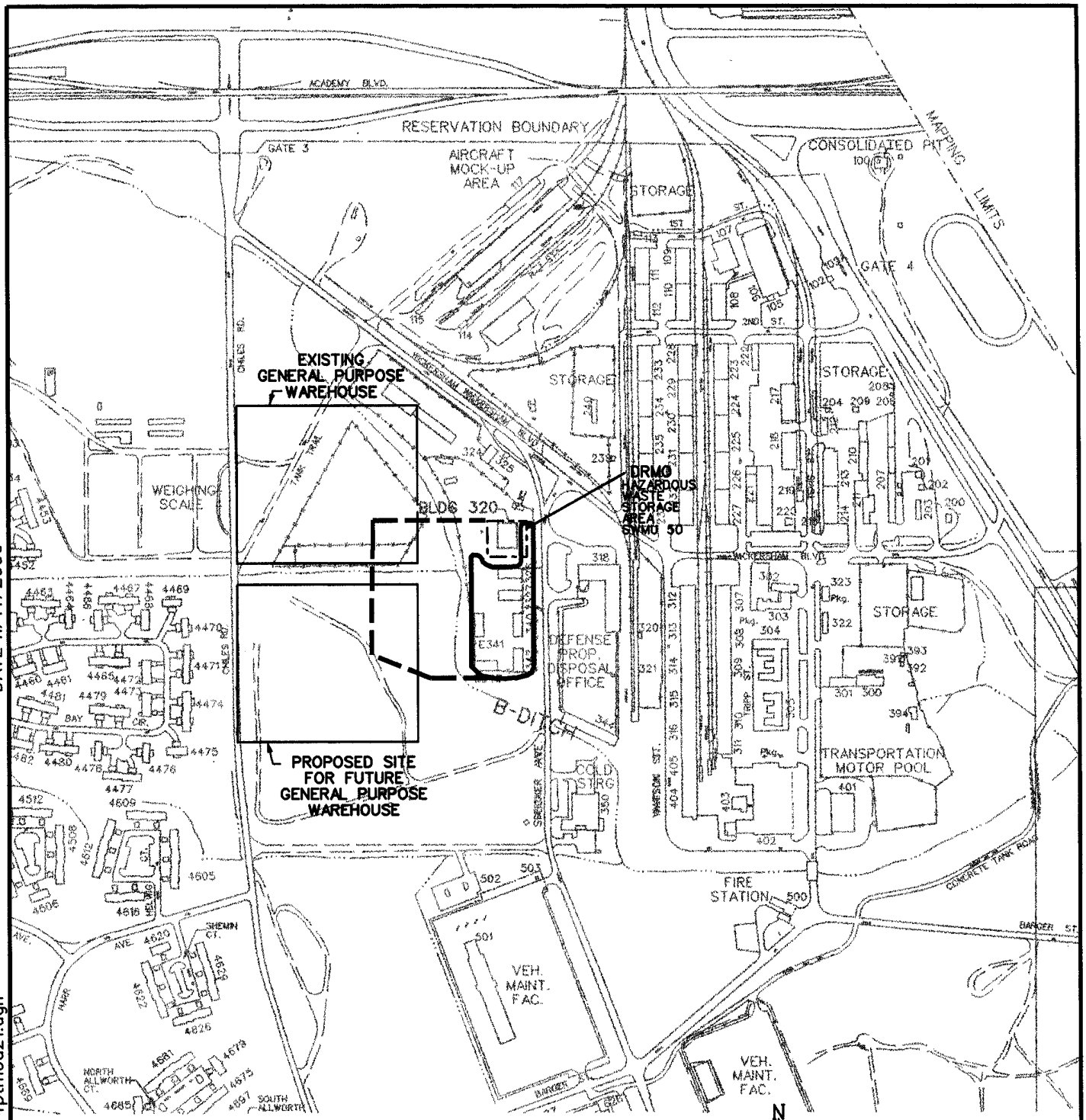
[2] Groundwater samples for Method 8260 will be unpreserved.

[3] Metals analyzed using Method 6010 include Al, Sb, Ba, Be, Cd, Ca, Cr, Cu, Co, Fe, Pb, Mn, Mg, Ni, K, Se, Ag, Na, Ti, V and Zn. Sample will be field filtered and result will be reported as dissolved concentrations.

[4] Mercury (Hg) is analyzed in water by Method 7470 and in soil by Method 7471. Sample will be field filtered and dissolved.

[5] Groundwater samples for Method 8021 will be preserved.

FIGURES



DATE: 11/14/2000

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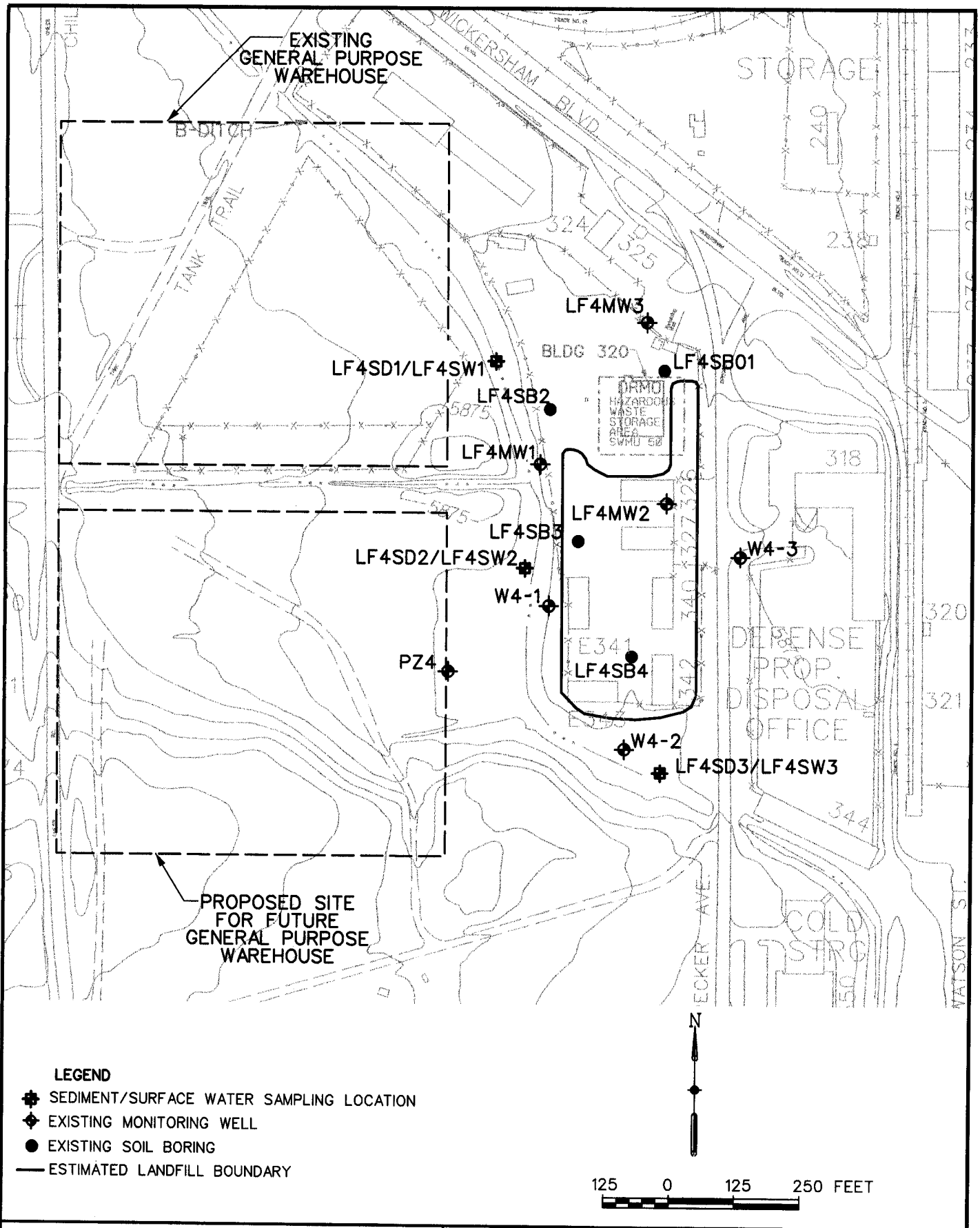
E A R T H T E C H

FIGURE 2-1

SITE LOCATION

LANDFILL 4
FORT CARSON, COLORADO



DATE:11/14/2000

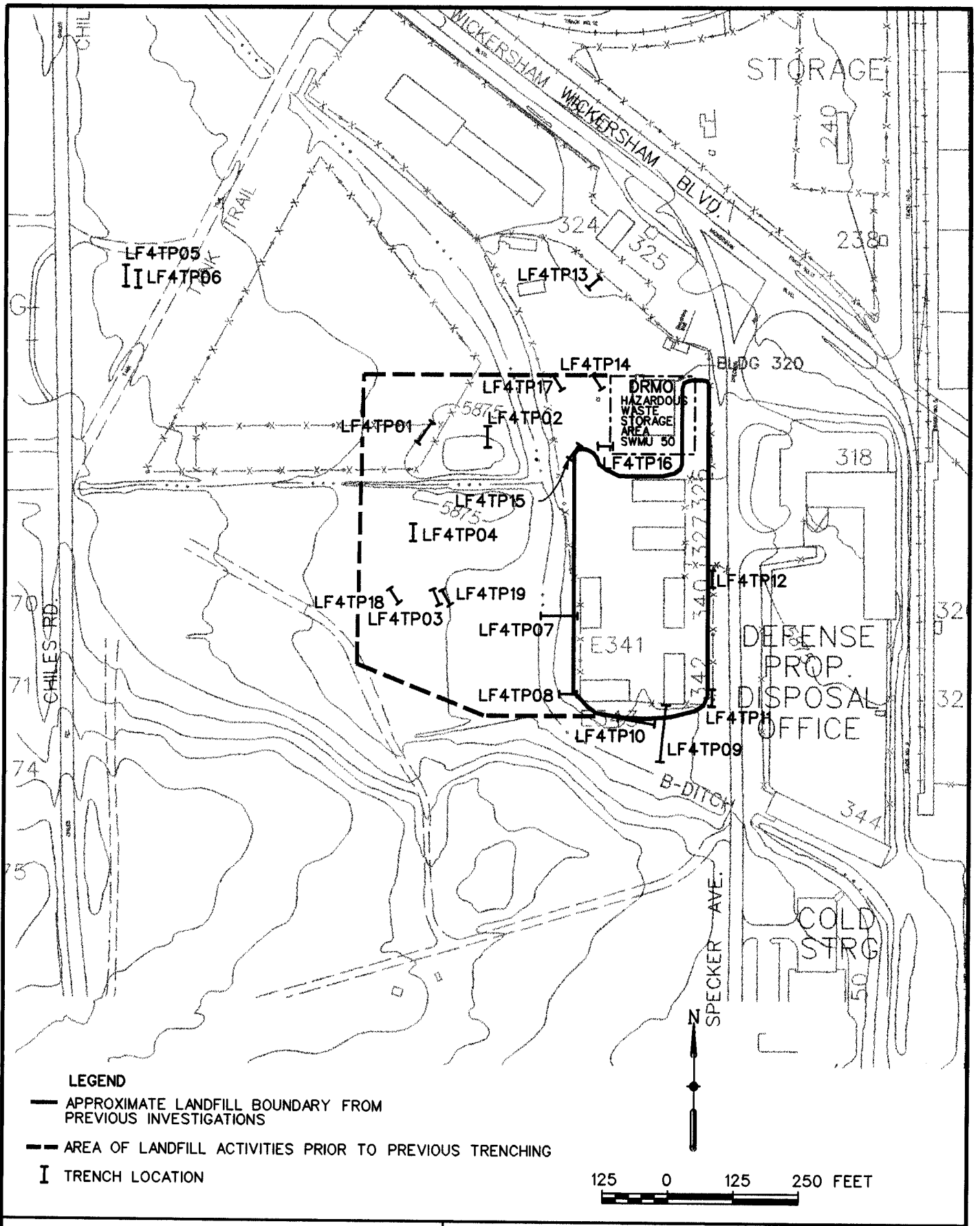
CAD FILE: 29188\CAD\FTCARSON\LF4\LF4SITMP3.DGN

EARTH TECH

FIGURE 2-2

PREVIOUS SAMPLE LOCATIONS

LANDFILL 4
FORT CARSON, COLORADO



DATE:11/14/2000

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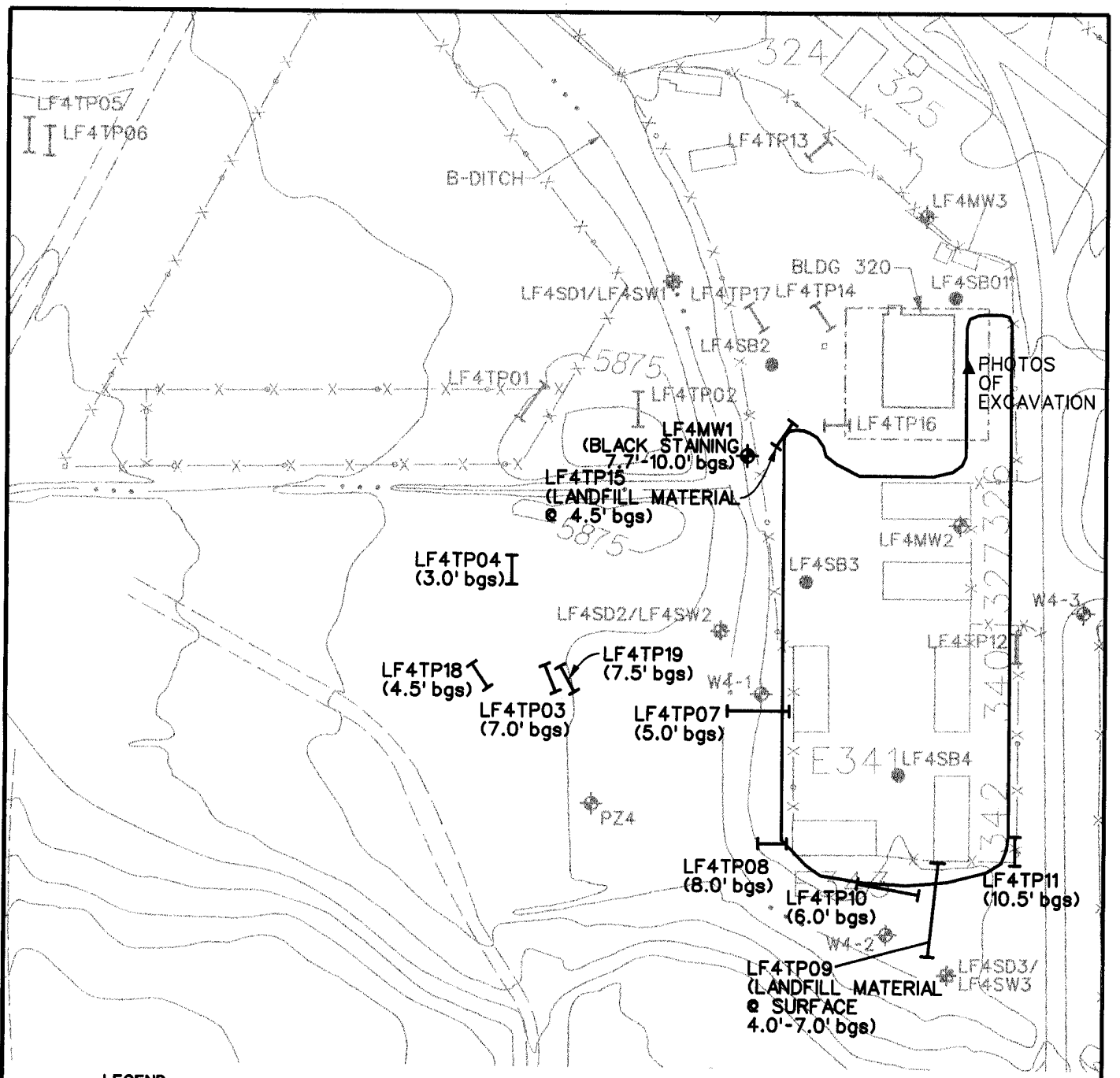
EARTH TECH

FIGURE 2-3

PREVIOUS TRENCH LOCATIONS

LANDFILL 4
FORT CARSON, COLORADO



LEGEND

- SEDIMENT/SURFACE WATER SAMPLING LOCATIONS
- EXISTING MONITORING WELL
- EXISTING SOIL BORING
- TRENCH LOCATION WITH LANDFILL MATERIAL OR BLACK ORGANIC LAYER
- TRENCH WITHOUT LANDFILL MATERIAL OR BLACK ORGANIC LAYER
- (7.0'bgs) DEPTH OF BLACK ORGANIC LAYER BELOW GROUND SURFACE (bgs)
- PHOTOS OF BUILDING EXCAVATION
- LANDFILL BOUNDARY

NOTE: OTHER CONTAMINATION/IMPACT TO SOIL

N

85 0 85 170 FEET

DATE:11/6/2000

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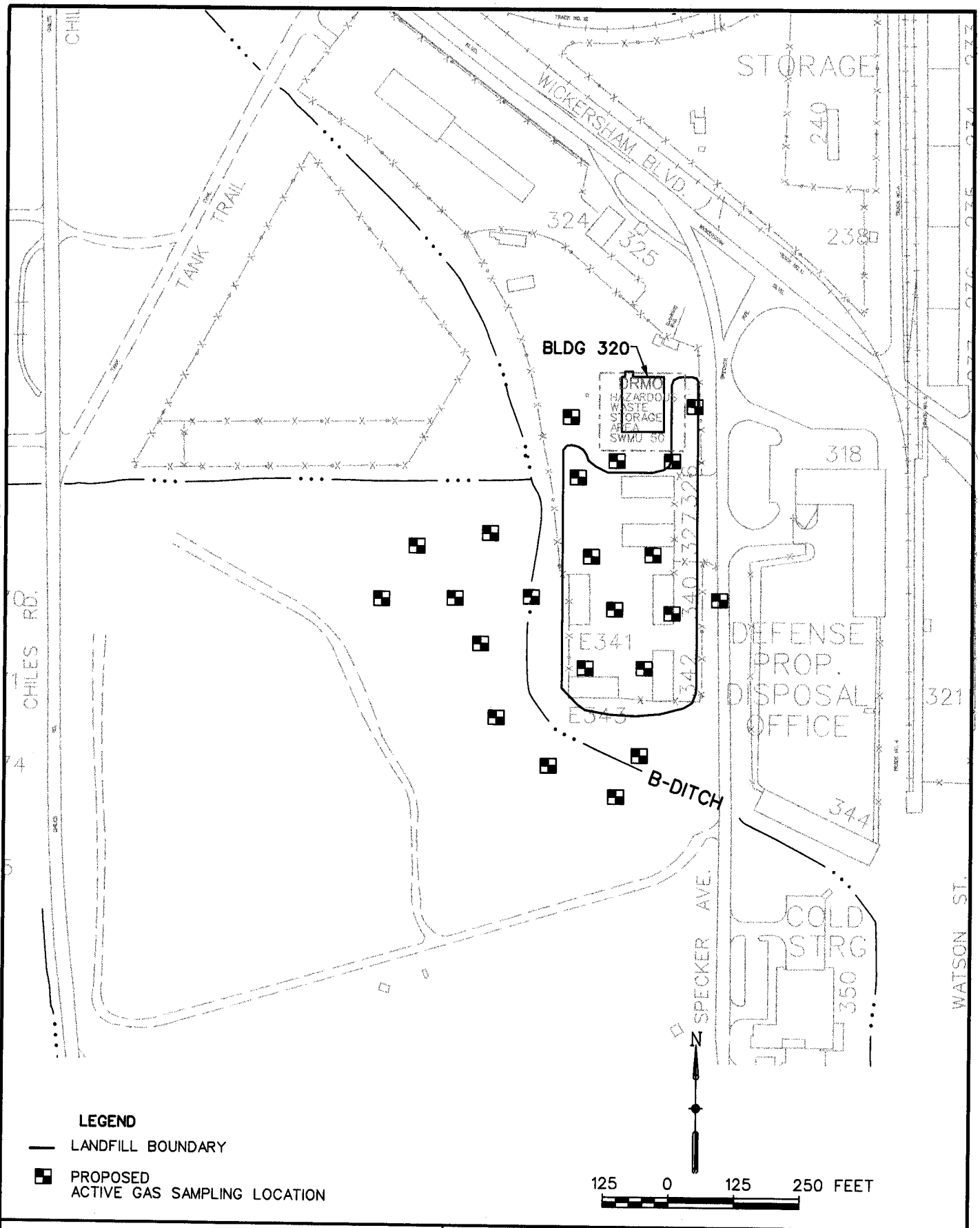
EARTH TECH

FIGURE 2-4

LANDFILL MATERIAL AND BLACK ORGANIC LAYER LOCATIONS

LANDFILL 4
FORT CARSON, COLORADO



DATE:11/9/2000

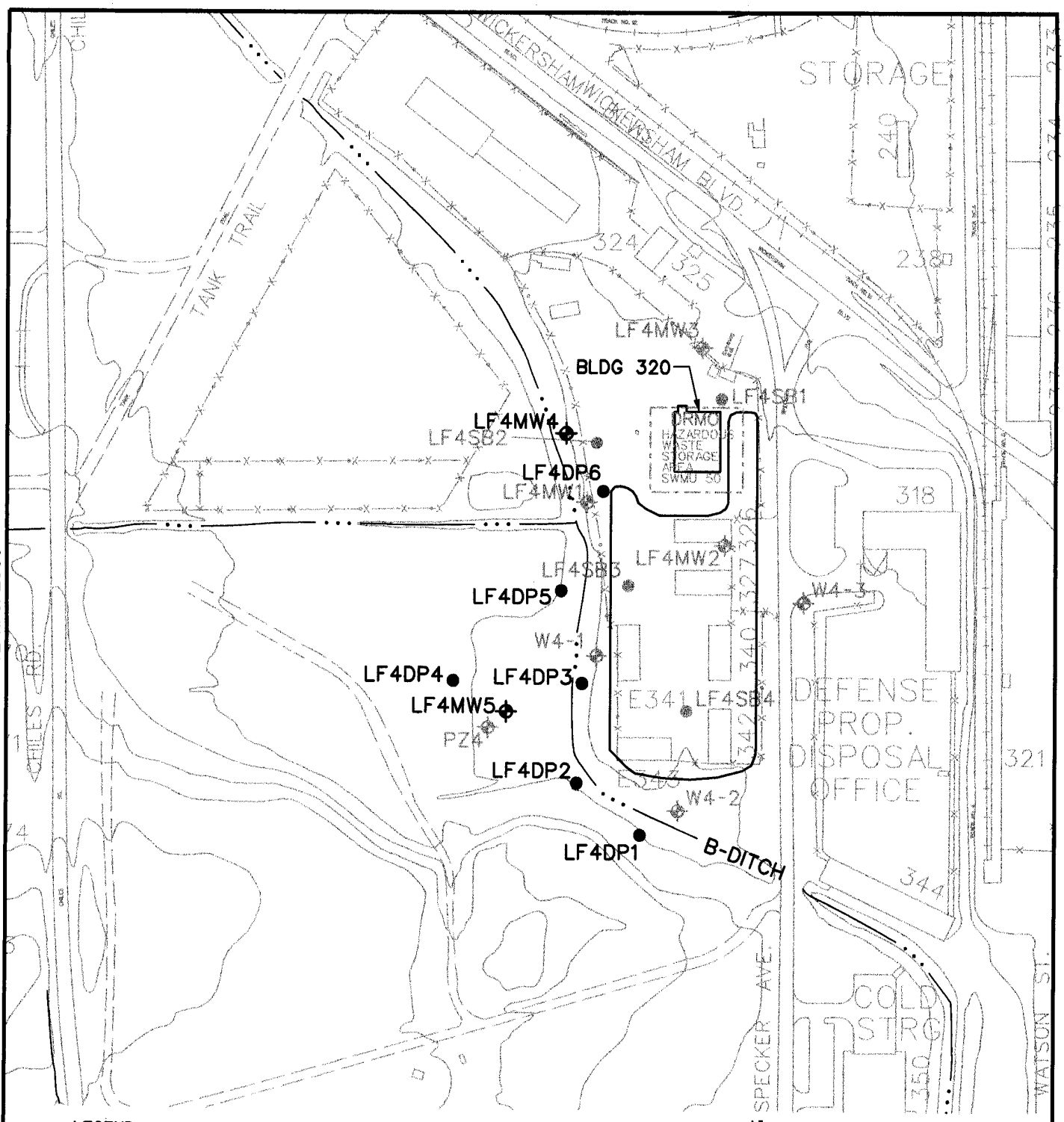
CAD FILE: 29188\CAD\FTCARSON\LF4\LF4PTMOD41.DGN

EARTH TECH

FIGURE 4-1

PROPOSED ACTIVE GAS SAMPLING LOCATIONS

LANDFILL 4
FORT CARSON, COLORADO



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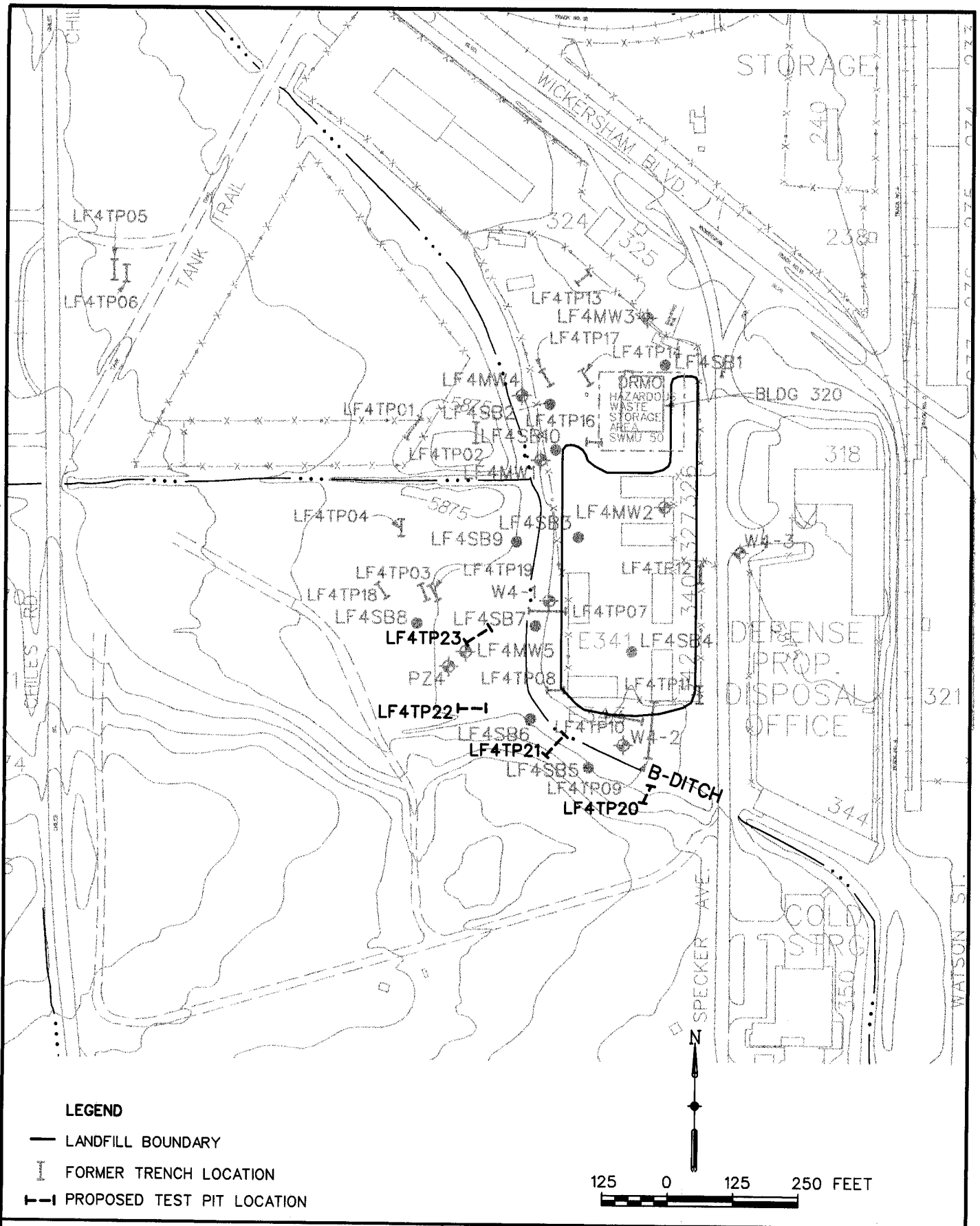
EARTH TECH

FIGURE 4-2
PROPOSED DIRECT PUSH AND PERMANENT MONITORING WELL LOCATIONS
LANDFILL 4
FORT CARSON, COLORADO



DATE:11/9/2000

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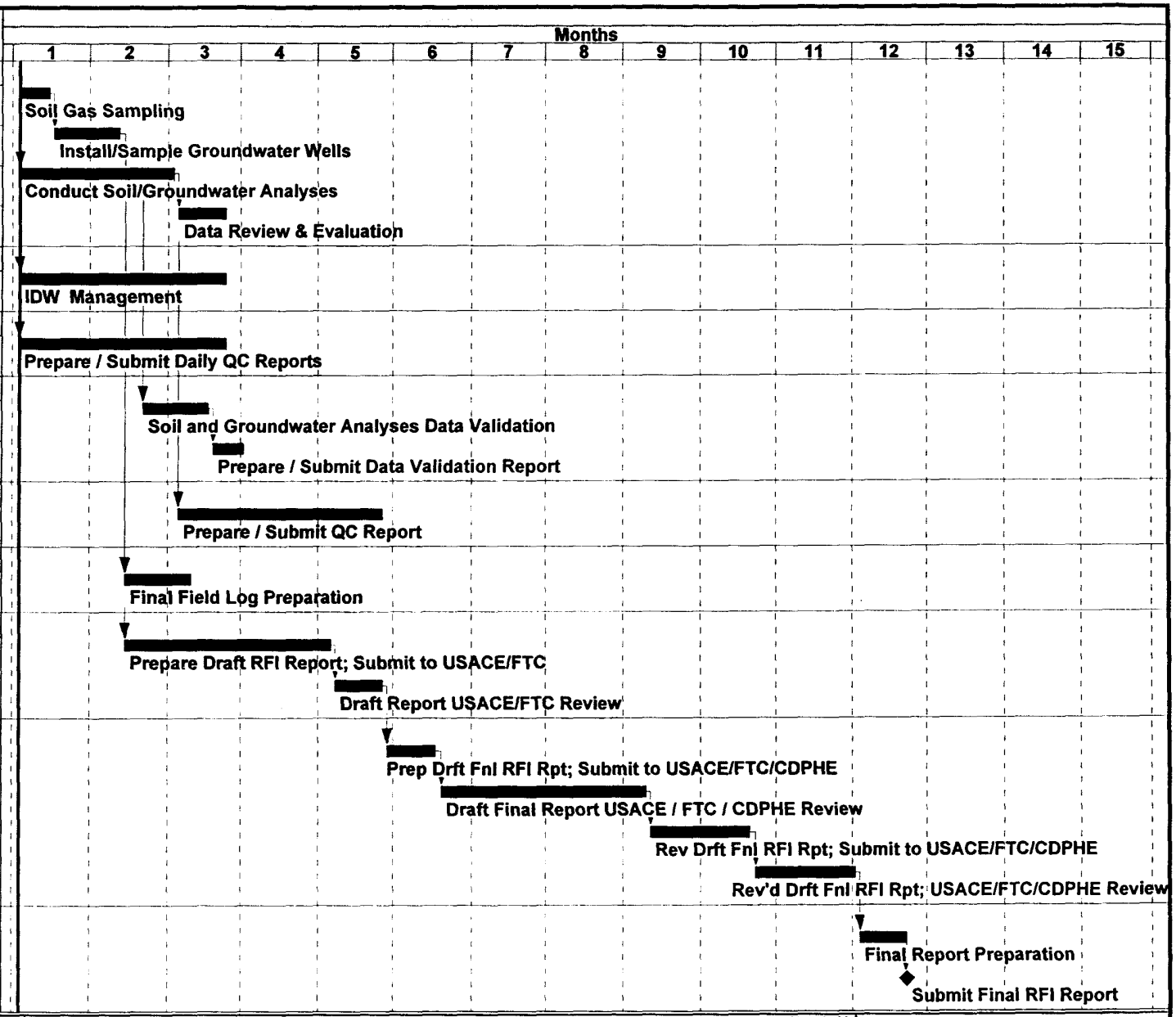
EARTH TECH

FIGURE 4-3

PROPOSED
TEST PIT LOCATIONS

LANDFILL 4
FORT CARSON, COLORADO

Activity ID	Activity description	Orig Dur
SOIL / GROUNDWATER SAMPLING		
1305	Soil Gas Sampling	10
1310	Install/Sample Groundwater Wells	20
1320	Conduct Soil/Groundwater Analyses	45
1325	Data Review & Evaluation	15
IDW MANAGEMENT		
1500	IDW Management	60
DQCRs		
1605	Prepare / Submit Daily QC Reports	60
DATA VALIDATION/ANALYTICAL DATA REP		
1705	Soil and Groundwater Analyses Data Validation	20
1710	Prepare / Submit Data Validation Report	10
QC SUMMARY REPORT PREPARATION		
1805	Prepare / Submit QC Report	60
FINAL FIELD LOG PREPARATION		
1900	Final Field Log Preparation	20
DRAFT RFI REPORT (Incl. RA)		
2105	Prepare Draft RFI Report; Submit to USACE/FTC	60
2110	Draft Report USACE/FTC Review	15
DRAFT FINAL RFI REPORT		
2115	Prep Drft Fnl RFI Rpt; Submit to USACE/FTC/CDPHE	15
2120	Draft Final Report USACE / FTC / CDPHE Review	60
2130	Rev Drft Fnl RFI Rpt; Submit to USACE/FTC/CDPHE	30
2140	Rev'd Drft Fnl RFI Rpt; USACE/FTC/CDPHE Review	30
FINAL RFI REPORT		
2205	Final Report Preparation	15
2210	Submit Final RFI Report	0



Run Date 28DEC99

Early Bar

Progress Bar

FUS2

Sheet 1 of 1

FORT CARSON
LANDFILL 4
FIGURE 6 - 1 PROJECT SCHEDULE

EARTH TECH
Environment & Infrastructure

APPENDIX A

SITE-SPECIFIC SAFETY AND HEALTH PLAN

SITE-SPECIFIC SAFETY AND HEALTH PLAN
LANDFILL 4
FORT CARSON, COLORADO

Contract No. DACW45-94-D-0001
Delivery Order No. 19

Prepared for:
U.S. Army Corps of Engineers
Omaha District

Prepared by:
Rust Environment & Infrastructure
Englewood, Colorado

SITE-SPECIFIC SAFETY AND HEALTH PLAN
LANDFILL 4
FORT CARSON, COLORADO

Rust Environment & Infrastructure
5575 DTC Parkway, Suite 200
Englewood, Colorado 80111

Prepared by:

John Visty
Project Safety and Health Manager

Reviewed by:

John England, P.E.
Chief Project Manager

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LIST OF ACRONYMS AND ABBREVIATIONS

ACGIH	American Conference of Governmental Industrial Hygienists
ANSI	American National Standards Institute
CFR	Code of Federal Regulations
CNS	Central Nervous System
dBA	Decibel (A-weighted)
FID	Flame Ionization Detector
IDLH	Immediately Dangerous to Life or Health
MSDS	Material Safety Data Sheets
NIOSH	National Institute of Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PID	Photoionization Detector
PPE	Personal Protective Equipment
ppm	parts per million
PSHM	Project Safety and Health Manager
PSSHP	Programmatic Site Safety and Health Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
ROPS	Rollover Protective Structures
Rust	Rust Environment & Infrastructure
SCBA	Self-Contained Breathing Apparatus
SSHO	Site Safety and Health Officer
SSHP	Site-Specific Safety and Health Plan
TERC	Total Environmental Restoration Contract
USACE	U.S. Corps of Engineers
WBGT	Wet Bulb Globe Temperature Index

A1.0 INTRODUCTION

The following Site-Specific Safety and Health Plan (SSHP) is intended as an addendum to the Programmatic Site Safety and Health Plan (PSSHP) developed for project work completed under the Fort Carson Total Environmental Restoration Contract (TERC). The PSSHP represents a comprehensive minimum health, safety, and emergency guidance document required for activities at the site contracted to Rust Environment & Infrastructure (Rust) on the Fort Carson Military Reservation in Colorado Springs, Colorado. This SSHP contains information specific to the Fort Carson Landfill 4 Resource Conservation Recovery Act (RCRA) Facility Investigation (RFI).

This SSHP has been prepared in conformance with U.S. Army Corps of Engineers (USACE) Safety and Health Requirements Manual EM 385-1-1, Occupational Safety and Health Administration (OSHA) Title 29 Code of Federal Regulations (CFR) 1910.120 - Hazardous Waste Site Operations and Emergency Response, 29 CFR 1910.1200 - Hazard Communication, 29 CFR 1910.134 - Respiratory Protection, and 29 CFR 1926 - Construction. Compliance with this SSHP is required of all Rust Team personnel who are involved on the Fort Carson RFI at Landfill 4.

A2.0 SITE DESCRIPTION

Landfill 4 is located in the northwest corner of the Cantonment Area, bordered by B Ditch to the west and south and Specker Avenue to the east. Currently, the Defense Reutilization Marketing Office yard and Buildings 326 and 327 reside and operate on the abandoned landfill. The approximate location of Landfill 4 is shown on Figure A-1.

A3.0 SCOPE OF WORK

The continued site investigation for Landfill 4 will include site clearance, soil gas evaluation, and groundwater evaluation.

A3.1 SITE CLEARANCE

Prior to mobilization of subcontractors to Landfill 4, the area of investigation will be cleared for underground utilities and structures. This clearance will be performed by Fort Carson personnel.

A3.2 SOIL GAS EVALUATION

Soil gas sampling will occur to ascertain the presence of landfill and/or volatile organic gases to assist in the definition of the site's boundaries and more accurately determine the optimal location of the planned subsurface investigations.

A3.3 GROUNDWATER EVALUATION

Two monitoring wells located in the vicinity of Landfill 4 have been sampled during the Fort Carson Quarterly Groundwater Monitoring Program. Two groundwater monitoring wells will be installed and sampled to further screen for possible influence of chemicals of concern into the groundwater in the immediate vicinity of landfill.

A4.0 PROJECT PERSONNEL

The following is a list of the key project personnel, organizations, and telephone numbers.

Name	Title	Organization	Telephone Number
John Shaler	Program Manager	Rust	303/694-6660
John England, P.E.	Chief Project Manager	Rust	303/694-6660
Mike Finochio, P.E.	Task Manager	Rust	303/694-6660
Mark Yaskanin, P.E.	Project Engineer	Rust	303/694-6660
John Visty	Project Safety and Health Manager	Rust	719/471-4876
Jim Henderson	Remedial Program Manager	Fort Carson	719/526-8001
Linda White, P.E.	Technical Manager	USACE	402/221-7672
To Be Determined	Field Operations Lead	Rust	303/694-6660
Jon Kaibel	Site Safety and Health Officer	Rust	719/471-0162
To Be Determined	Quality Assurance/Quality Control Officer	Rust	303/694-6660

A5.0 HAZARD OVERVIEW

The primary health and safety hazards associated with RFI activities at Landfill 4 are:

- Chemical hazards;
- Physical hazards;
- Biological hazards; and
- Ergonomic hazards.

Several hazards may be encountered during the course of each task. Anticipated hazards are addressed in the following sections. Some of these hazards and their respective safety controls are detailed in the PSSHP. Those that are not addressed in detail in the PSSHP are detailed here as they are specific to this task at Landfill 4.

A5.1 CHEMICAL HAZARDS

Chemical hazards may be encountered if waste material is exposed or through contact with decontamination chemicals. Facility reports indicate that Landfill 4 was used to dispose of sanitary wastes and small amounts of waste petroleum, oil, and lubricants. Table A-1 presents compounds of concern that may be present during landfill activities.

Material Safety Data Sheets (MSDS) for any chemicals used on site will be obtained prior to or upon their delivery. Each MSDS will be reviewed by the Site Safety and Health Officer (SSHO) and modifications to SSHP procedures will be made. The information provided by the MSDS will be reviewed with those affected employees prior to the chemicals use during periodic safety briefings. The MSDS and the chemicals will be managed as outlined in Section 6.10 of the PSSHP.

A5.2 PHYSICAL HAZARDS

- Unintentional release of hazardous substances in the form of natural gas and contaminated rinse water;
- Heavy equipment hazards from drill rigs, backhoes, and front end loaders;
- Electrical from the use of electrical powered equipment and connecting electrical lines;
- Noise from heavy equipment; and
- Vibration from the use of power tools.

Other physical hazards include temperature stress and illumination-related hazards when working outside during low level daylight hours. Each of the above-mentioned hazards and the corresponding control methods are discussed in the PSSHP. Site-specific hazards that may be encountered are included here.

A5.2.1 General System Hazards

Physical processes associated with this task will involve mechanical equipment. Where moving parts are exposed, employees must be cognizant of their location and shall avoid inadvertent placement of appendages, clothing, or equipment where they could enter the machinery.

This includes hazards related to the operation of motor vehicles, heavy equipment, steam cleaners or high-pressure washers. These hazards are not unique and are generally familiar to most workers on a hazardous waste site.

Additional unforeseen hazards may arise once work begins and as site conditions change. Potential hazards will be analyzed on a task-specific basis by the Rust SSHO and the Rust Project Safety and Health Manager (PSHM) as necessary.

A5.2.2 Slip, Trip, and Fall Hazards

Slip, trip, and fall hazards are expected to be a major potential hazard encountered during site activities. Common surface falls can be divided into the following four categories:

- Trip and fall accidents can occur when workers encounter an unseen foreign object in their path. When a foot strikes the object, the employee trips and falls.
- Step and fall accidents can occur when a worker's foot suddenly meets a sticky surface or a defect in the walking surface. Expecting to continue at the established pace, the worker falls when his or her foot is unable to respond properly.
- Step and fall accidents can occur when the foot encounters an unexpected step down. This can also happen when an employee thinks he or she has reached the bottom of the stairs when, in reality, there is one more step.
- Slip and fall accidents can occur when the worker's center of gravity is suddenly thrown out of balance.

Rust plans to use the following strategies to help prevent slip, trip, and fall hazards:

- Practice good housekeeping. All working areas will be kept as clean and dry as possible.
- Require nonskid footwear. All employees will be required to wear footwear with nonskid soles.
- Inspect surfaces on a daily basis at a minimum. One person on each crew will be required to conduct daily inspections of the work area and act immediately when a hazard is identified. In addition, all personnel will immediately notify their supervisor or the SSHO whenever a slip, trip, or fall hazard occurs.

A5.2.3 Control of Hazardous Energy (Lockout/Tagout)

During the course of the project, employees may be exposed to hazardous energy sources including energized electrical lines and circuits. Release of this electrical energy could lead to serious

contractor performing the work. The SSHO will ensure the contractor has a hazardous energy control plan which is in compliance with EM 385-1-1.

- The SSHO or designee will coordinate, approve, and be present for all activities requiring lockout/tagout.

- The SSHO will conduct an inspection of the worksite to ensure all hazardous energy sources are identified and their main source switch or valve located.

- The SSHO or designee will notify those employees involved in the activity and those individuals who may potentially enter the location of the main energy isolating device and/or the location where activities will take place.

- The SSHO or designee will place a suitable locking device on the main energy isolation device to isolate the energy after a qualified, knowledgeable person (i.e., person with a thorough knowledge of the system being controlled, including its operation, its associated hazards, and its control) turns off the energy source. If there is no way to place a locking device on the isolating device, a tag will be placed with employees giving clear instruction as to its purpose.

- A suitable locking device is one which is capable of withstanding the environment in which it is being used for the duration of its use. In addition, the locking device will have a means of indicating who applied it. It will be substantial enough and operate in a way as to eliminate the possibility of unauthorized or in advertent removal without the use of excessive force or unusual techniques (e.g., bolt cutters).

- All employees involved in the activity will be briefed on the lockout/tagout requirements as a review of the discussion provided in the site-specific training.

- Following placement of the locking device or tag, the system will be tested by a qualified individual to ensure that the system has been de-energized.

- If the activity is stopped prior to its completion for breaks, lunch, end of day, etc., the SSHO will inspect the site and the lockout/tagout devices prior to leaving the site. In addition, prior to proceeding with the activity after the work stoppage, the SSHO will once again inspect the site and the lockout/tagout devices to ensure all is safe to resume. These inspections will be

A5.2.4 Electrical Shock Prevention

Various pumps and other machinery are operated by electrical current. All electrical equipment will be properly grounded. The use of ground-fault circuit interrupters or equivalent for hand tools is necessary to eliminate the potential for electric shock. All equipment must be approved for the class of hazard as listed in OSHA standards for electrical power (29 CFR 1926, Subpart K).

A5.2.5 Electrical Safety

Extension cords shall be the three-wire type for grounded tools (two-wire is permissible for double-insulated tools) and shall be protected from damage. Electrical cords shall not be fastened with staples or extended across aisles or walkways. Worn or frayed cords shall not be used and will be cut to prevent inadvertent use. Cords shall not be run through doorways where the door could cut or damage them.

Exposed bulbs on temporary lights shall be guarded to prevent accidental contact, except where bulbs are deeply recessed in the reflector. Temporary lights shall not be suspended by their electric cords unless specifically designed for this use. Explosion-proof bulb covers shall be used when contact with flammable vapors or gases is possible and shall met Class I, Division I, requirements.

Receptacles for attachment plugs shall be of the approved, concealed, contact type. Where different voltages, frequencies, or types of current are supplied, receptacles shall be of such design that attachment plugs are not interchangeable.

Electrical tools and appliances used in wet environments shall require ground fault interrupters and watertight connectors.

A5.2.6 Crush Potential

A crushing hazard exists when a part of the body may be caught between two hard surfaces which progressively move together. Generally there are three categories for crushing hazards: squeeze points; run-in points; and impact hazards.

Squeeze-point hazards exist where two hard surfaces, at least one of which must be in motion, push close enough together to crush an object that may be located between them.

Run-in point hazards exist where two objects, at least one of which is rotating, move progressively close together. The gap between the objects need not become completely close but only be smaller than the body part lodged in it.

Impact hazards are accidents that involve acceleration and impact. Examples of impact hazards are a heavy object falling on a foot or a hammer hitting a finger.

The following general safeguards will be used to prevent injuries from crushing actions:

- All self-propelled construction and industrial equipment will be equipped with operating back-up alarms.
- All belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, and other moving parts will be guarded where those parts may be contacted by persons or create a hazard.
- Guards shall be left in place except when their removal is necessary for maintenance and only after the equipment has been appropriately locked-out or otherwise protected from starting.
- Appropriate personal protective equipment (PPE) will be worn (i.e., hardhats, steel toed shoes/boots) as necessary to protect against crushing hazards.

- Personnel shall keep hands and other body parts away from moving objects and always be on guard for moving objects and vehicles.

The following guidelines will be used when establishing safeguards during site activities to ensure that the safeguard:

- Prevents contact with the hazard;
- Is secure and durable;
- Protects against falling objects;
- Creates no new hazard;
- Does not interfere with work that needs to be performed; and
- Allows for safe maintenance.

A5.2.7 Noise Hazards

Noise is a potential hazard associated with the operation of heavy equipment, pumps, generators, jackhammers, and power tools. Engineering and administrative controls will be implemented at 85 decibels (dBA) when possible to reduce noise levels in the work zones. Noise hazard areas will be marked with caution signs indicating the presence of hazardous noise levels and the requirements for hearing protection.

A5.2.8 Underground/Overhead Utilities

Rust will coordinate with Fort Carson personnel to identify the locations of all underground utilities prior to any excavation. Damage to underground utilities during site activities could lead to electric shock, explosion, and serious injury. Before beginning work, the SSHO will verify and inspect work procedures and equipment and the location of overhead lines to ensure that no portion of an individual or equipment is brought within the safe minimum clearance detailed in Table 5-1 of the PSSHP. Whenever possible, all circuits adjacent to the planned activity shall be de-energized by Fort Carson personnel, who will then provide the SSHO with written verification of the de-

A5.2.9 Heat Stress

Heat stress is caused by external heat sources such as high ambient air temperature and direct sunlight or internal body heat build-up resulting from heavy work or prolonged use of protective gear. Heat stress may manifest itself as heat cramps, heat exhaustion, and heat stroke. See the PSSHP for a further discussion of heat stress.

The SSHO will establish a work/rest schedule, as recommended by the American Conference of Governmental Industrial Hygienists (ACGIH), on a daily basis depending on weather conditions and site activities. Rest should be sought in the shade. Table A-2a will be used as a guide for establishing a work/rest regimen when workers are required to wear a basic work uniform. Wet Bulb Globe Temperature Index (WBGT) values will be corrected by subtracting 6 from each value when workers are in any level of protection. While it is anticipated that respiratory protection will be the only additional personal protection device required over and above the standard construction wear, Table A-2b will be used as a guide for establishing a work/rest regimen when workers are required to wear any level of protection (including a respirator).

A5.2.10 Cold Stress

Cold stress conditions may exist during this project. Cold stress, including frostbite and hypothermia, can result in severe health effects. Bare flesh and areas with high surface area to body volume ratios are highly susceptible to wind chill or low temperatures. The PSSHP has a detailed discussion of cold stress.

Monitoring for cold stress is difficult and will be accomplished by the SSHO by monitoring for symptoms of frostbite and hypothermia and monitoring the weather conditions on a daily basis. In addition, project team personnel will be equipped with adequate cold protective clothing. The

A5.2.11 Illumination Requirements

A portion of the project work may be conducted during low light level periods in the mornings and evenings. Each area must have adequate lighting for personnel to perform work activities safely and to identify potential hazards. While work activities are in progress, access ways and site work areas will be lighted to at least the minimum light intensities specified in Minimum Lighting requirements of EM 385.1-1 (Table A-4).

A5.2.12 Hand and Power Tools

Hand and power tools may be utilized on this project. Safety tips and recommendations for the safe use of hand and power tools are listed below.

- Power tools shall be of a manufacture listed by a nationally recognized testing laboratory for the specific application for which they are to be used.
- Hand and power tools shall be used, inspected, and maintained in accordance with the manufacturer's instructions and recommendations and shall be used only for the purpose for which they are designed. A copy of the manufacturer's instructions and recommendations shall be maintained with the tools.
- Hand and power tools shall be inspected, tested, and determined to be in safe operating condition prior to use. Continued periodic inspections shall be made to assure safe operating condition and proper maintenance.
- Hand and power tools shall be in good repair, with all required safety devices installed and properly adjusted. Tools having defects that will impair their strength or render them unsafe shall be removed from service.
- Power tools designed with guards shall be equipped with such guards when in use.
- When work is being performed overhead, tools not in use shall be secured or placed in holders.

A5.2.13 Heavy Equipment Safety

Heavy equipment can represent a substantial hazard to workers. In general, the following requirements will be adhered to for motor vehicles and material handling equipment provided in the OSHA Construction Industry Standard 29 CFR 1926, Subpart O and applicable sections of EM 385-1-1.

- Use common sense. Workers will not assume that the equipment operator is keeping track of their whereabouts. Never walk directly in back of or to the side of heavy equipment without the operator's knowledge.
- Hard hats, steel-toe boots, and safety glasses are to be worn at all times around heavy equipment. Other protective gear as specified in this health and safety plan is also applicable.
- Remain alert at all times.
- Maintain visual contact at all times.
- Establish hand signal communication when verbal communication is difficult. Identify one person per work group to give hand signals to equipment operators.
- Be aware of footing at all times.
- Only qualified/licensed people are to operate heavy equipment.
- Use chains, hoists, straps, and any other equipment to safely aid in moving heavy materials.
- Use proper personal lifting techniques.
- Equipment will not be used by individuals who are not familiar with its operation. This applies to heavy and light equipment (e.g., chain saws)
- Be sure that no underground or overhead power lines, sewer lines, gas lines, or telephone lines will present a hazard in the work area.
- Keep all non-essential people out of the work area.

- When an equipment operator must negotiate in tight quarters, provide a second person to ensure adequate clearance.

- Implement an ongoing maintenance program for all tools and equipment. Inspect all tools and moving equipment regularly to ensure that parts are secured and intact with no evidence of cracks or areas of weakness, that the equipment turns smoothly with no evidence of wobble, and that it is operating according to manufacturer's specifications. Promptly repair or replace any defective items. Keep maintenance and repair logs.

- Store tools in clean, secure areas so that they will not be damaged, lost or stolen.

- Keep all heavy equipment that is used in the exclusion zone in that zone until the job is done. Completely clean such equipment within the designated vehicle decontamination area.

- Parking brakes will be engaged when equipment is not in use.

- All vehicles with rollover protective structures (ROPS) will have seat belts; operators will be trained in the use of seat belts, and the seat belts will be used at all times during vehicle operation.

- With certain exceptions provided in 29 CFR 1926, Subpart O, all material handling equipment will be provided with ROPS.

- Equipment with an obstructed rear view must have an audible alarm that sounds when it is operating in the reverse direction (unless a spotter guides the vehicle operator).

- Material handling equipment that lacks ROPS must not be operated on a grade unless the grade can safely accommodate the equipment involved.

- A safety barrier will be used to protect workers whenever a tire is inflated, removed, or installed on split rims.

- Heavy equipment will be inspected by the operator prior to the beginning of each work shift, and the SSHO will ensure the compliance with this regulation.

- All implements shall be completely lowered when equipment is not in use.

- Operators will not jump from heavy equipment.

Prior to opening an excavation, underground installations (e.g., sewer, telephone, water, fuel, electric lines) will be located and protected from damage or displacement. Fort Carson shall be responsible for locating and marking the locations.

A5.3 BIOLOGICAL HAZARDS

Biological hazards that may be present in the vicinity of the worksite include spiders, bees, wasps, ticks, prairie dogs, and snakes. Considerations for biological hazards may be necessary when workers are required to enter remote or seldom-visited locations. Biological hazards are detailed in Section 5.3 of the PSSHP.

Spiders, bees, and wasps can be considerable hazard for those people with known allergic reactions to the venom. The SSHO should be notified if any worker is sensitive to these biological hazards.

Ticks may also be a hazard at the landfill. Tick-borne disease is generally caused by a bacterium which may be transmitted by the bite of a tick. When an infected tick bites, the bacterium is passed in the bloodstream of the host. The various stages and symptoms of the disease are well recognized and, if detected early, can be treated with antibiotics.

When in an area suspected of harboring ticks, the following precautions can minimize the chances of being bitten by a tick:

- Wear long pants and long-sleeved shirts that fit tightly at the ankles and wrists;
- Wear light-colored clothing so ticks can be easily spotted;
- Use tick repellents;
- Inspect clothing frequently while in tick habitat; and

may have been acquired. Wipe the bite thoroughly with an antiseptic and seek medical attention as soon as possible.

Bloodborne pathogens may also be a concern at Fort Carson. There is potential for worker injury during site-specific tasks, resulting in possible worker exposure to bloodborne pathogens (e.g., hepatitis B virus and human immunodeficiency virus). To avoid occupational exposure, workers will be trained according to 29 CFR 1910.1030 (Occupational Exposure to Bloodborne Pathogens). More detail on bloodborne pathogen exposure control is provided in the PSSHP.

A5.4 ERGONOMIC HAZARDS

Ergonomics is the science of fitting people and their work tasks comfortably together. Employees should be aware of ergonomic controls that reduce on-the-job stress and strain. The following items will be reviewed to assess the ergonomic hazards during site activities:

- Are tasks being performed that involve unnatural or hazardous movements?
- Are tasks being performed that involve frequent manual lifting?
- Are tasks being performed that involve excessive wasted motion?
- Are tasks being performed that involve unnatural or uncomfortable postures?
- Are tasks being performed that should be automated?

Each task will be evaluated based on these questions, and controls will be implemented as is practical and feasible.

A6.0 EXPOSURE MONITORING

Monitoring of the environment at Fort Carson will be necessary to ensure that proposed levels of protection and procedures are adequate to ensure the health and safety of personnel on site. Monitoring of the environment will include ambient air monitoring, personal exposure monitoring, and heat/cold stress monitoring. The information gained will be used to adjust levels of protection, sampling and analytical techniques, and work/rest regimens.

A6.1 EQUIPMENT AND INSTRUMENTATION

The procedures for the operation and maintenance of real-time direct reading air monitoring instruments and personal sampling equipment for industrial hygiene parameters will be available at the Project Trailer. This project will require the following instrumentation: photoionization detector (PID) and/or flame ionization detector (FID); multi-function meter measuring oxygen, lower explosive limit and hydrogen sulfide; dust monitor; sound level meter; and a heat or cold stress monitor.

A6.2 MONITORING STRATEGY

Air monitoring shall be conducted to identify any immediately dangerous to life or health (IDLH) conditions and exposures over published exposure levels. See Table A-5 for monitoring requirements.

A6.3 REAL-TIME MONITORING

Real-time monitoring will be conducted during all invasive activities. See Table A-6 for real-time monitoring action levels. Additional monitoring will be required at the discretion of the SSHO.

A6.5 NOISE MONITORING

The SSHO will perform a general sound level survey of all tasks. Noise dosimetry will be conducted on those workers who represent the highest exposure potential.

A6.6 CALIBRATION/MAINTENANCE

All instruments (both real-time and personal sampling equipment) will be calibrated according to the manufacturers' recommendations. All equipment will be calibrated before and after use. A calibration log will be kept to record all calibrations. Real-time instrument results will be recorded in the daily safety log books used by each health and safety officer.

A6.7 METHODS

Integrated samples will be collected using National Institute of Occupational Safety and Health (NIOSH) methods or OSHA methods. Sampling flow rates will be in accordance with method requirements to assess the adequacy of PPE and potential exposure of employees to contaminants. Samples will be analyzed by an American Industrial Hygiene Association-accredited laboratory.

A6.8 EXPOSURE RECORDS

The SSHO will forward all personnel exposure records to the Rust Division Health and Safety Officer. A report of exposure will be provided, upon written request, to the individual within 15 days upon receipt of the results.

A7.0 PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

PPE will be used to reduce or eliminate chemical and physical hazards that may be encountered during field activities. Personnel shall wear protective equipment when field operations involve known or suspected hazards associated with activities at the worksite. Based on the hazards associated with specific activities, and air monitoring results, the SSHO will make the final determination. Where appropriate, PPE worn shall meet American National Standards Institute (ANSI) requirements. The level of protection for each activity associated with the task is included in Section A8.0.

The general ensemble components required to provide Level D, Level C, and Level B protection are listed in Tables A-7 through A-9. Based on site conditions, the expected level of protection for the site will be a mixture of Level D and Modified Level D. Levels C and B may be warranted if action levels are exceeded. Level D will generally consist of a hard hat, safety glasses, leather work gloves, and steel-toe work boots. Modified Level D includes chemical resistant coveralls and gloves in addition to the requirements of Level D.

A8.0 ACTIVITY HAZARD ANALYSIS

The hazards of each major task of the RFI project are identified below. Procedures to control the hazards associated with each phase are detailed in Sections A5.0 through A7.0 of this SSHP. These analyses are general in nature and do not serve as a substitute for formal hazard analyses which will be performed by the contractors prior to initiating each task. The forms, presented on Figure 7-1 of the PSSHP, will be completed by the contractor and reviewed with affected personnel as part of required safety briefings.

Only chemical and physical hazards are presented here as the ergonomic and biological hazards as described in Section A5.0 are the same for all phases. Where two levels of protection are provided, the lower of the two will be the initial level of protection as the higher level is listed only as a possible requirement. However, it is not anticipated or expected that the higher level would be required except in the event of an extreme situation. Monitoring will be conducted to ensure the appropriate level of protection is being worn by site personnel during each task.

A8.1 SITE CLEARANCE

- Chemical hazards: none anticipated
- Physical hazards: slip, trip, falls; temperature stress
- Level of protection: Level D

A8.2 GROUNDWATER EVALUATION

- Chemical hazards: contaminated groundwater
- Physical hazards: slips, trips, falls; vibration; power tools; noise; temperature stresses
- Level of protection: Modified Level D

A8.3 SOIL GAS EVALUATION

- Chemical hazards: contaminated soil and/or groundwater, incinerator ash, landfilled material,

A9.0 SITE CONTROL AND DECONTAMINATION

A9.1 SITE CONTROL

Site control will be accomplished with existing construction site control measures. Work zones will be established around activities which create hazards but will be removed immediately when the hazard ceases. No contaminated materials are expected to be encountered.

A9.2 DECONTAMINATION

All RFI field equipment will be decontaminated as described in the Field and Laboratory Procedure Manual. Emergency equipment will be available (i.e., safety shower and eyewash) in the event an emergency decontamination is required.

A10.0 EMERGENCY RESPONSE PLAN

The PSSHP describes the details of the Emergency Response Plan. Below is a summary of emergency information. Directions to the hospital are shown on Figure A-2.

HOSPITALS:	Penrose Hospital 2215 N. Cascade Avenue Colorado Springs, CO 80907 719-630-5000
Directions to Off-site Medical Facility:	From Fort Carson take Highway 115 (South Nevada Avenue). Proceed north 6.5 miles to Jackson Street. Proceed west on Jackson one block to Emergency Room Entrance.
FIRE/RESCUE:	9-911
AMBULANCE:	9-911
Fort Carson Security:	719/526-2333; if on post, dial 2123
Fort Carson Health and Safety Office:	Building 1818 719/526-7000
Fort Carson Environmental Coordinator:	Jim Henderson 719/526-8001
National Response Center:	1-800-424-8802

TABLES

TABLE A-1
TOXICOLOGICAL AND PHYSICAL PROPERTIES OF COMPOUNDS OF POSSIBLE CONCERN

Compound	CAS #	Hazard[b]	Volatility[c]	Skin Absorption[d]	Carcinogen[e]	Exposure Limit[f]	
Landfill Gas - methane	74-82-8	3	Yes	No	No	N/A	Flammable gas. Usually present in landfill as a result of decomposition of organic material. Also considered a simple asphyxiant.
Landfill Leachate	varies	varies	Yes	Possibly	Possibly	varies	Contains various organic compounds in small amounts. May be accompanied by landfill gas.
Hydrogen Sulfide	7783-06-4	3	No	No	No	10 ppm	A human poison by inhalation. A severe irritant to eyes and mucous membranes. An asphyxiant. Human systemic effects by inhalation include coma and chronic pulmonary edema.
1,1-dichloroethane (1,1-DCA)	75-34-3	3	Yes/Vol	Yes	Probable	100 ppm	Chloroform-like odor. Causes central nervous system (CNS) depression upon inhalation exposure. It is a skin irritant and, upon chronic exposure, attacks liver and kidneys. Reacts vigorously with oxidizing materials.
1,1-dichloroethene	75-35-4	3	Yes	Yes	Yes	5 ppm	Non-combustible liquid. Routes of exposure include inhalation, irritation to mucous membrane and the eyes. May cause headache, light-headedness upon inhalation of vapors.
1,1,1-trichloroethane (1,1,1-TCA)	71-55-6	2	Yes/Vol	Yes	Yes	350 ppm	Colorless liquid with a mild chloroform-like odor. The inhalation and skin absorption toxicity is low in humans. Overexposure has a narcotic effect and may cause injury to the liver and kidneys. Eye and skin irritant.
1,1,2-trichloroethane (1,1,2-TCA)	79-00-5	3	Yes/Vol	Yes	Probable	10 ppm	Non-combustible liquid that is irritating to nose and eyes. It is a CNS depressant that attacks the liver and kidneys. Sweet chloroform-like odor.
cis-1,2-dichloroethylene (1,2-DCE)	540-59-0	2	Yes/Vol	Yes	Yes	200 ppm	Non-combustible liquid. Routes of exposure include inhalation, ingestion and absorption through the skin. Can cause irritation to mucous membrane and the eyes. May cause headache, light-headedness upon inhalation of vapors.

TABLE A-1
TOXICOLOGICAL AND PHYSICAL PROPERTIES OF COMPOUNDS OF POSSIBLE CONCERN

Compound	CAS #	Hazard[b]	Volatility[c]	Skin Absorption[d]	Carcinogen[e]	Exposure Limit[f]	
Trichloroethylene	79-01-6	3	Yes/Vol	Yes	Yes	100 ppm	Colorless liquid with a chloroform-like odor. Exposure through inhalation, skin absorption, ingestion and/or direct contact can cause irritated skin and eyes, vomiting, liver damage and cardiac irregularities.
Benzene	71-43-2	3	Yes/Vol	No	Yes	1 ppm	Colorless liquid with an aromatic odor. Irritating to eyes, respiratory system. Inhalation can result in headache, nausea, fatigue. Carcinogenic to humans. Attacks blood, bone marrow, and CNS.
Toluene	108-88-3	3	Yes/Vol	Yes	No	50 ppm	Colorless liquid with sweet, pungent odor. Enters body through inhalation, skin absorption, skin and eye contact. Irritates eyes, respiratory tract, and skin. Causes dermatitis, acute exposure can cause depression of CNS.
Ethylbenzene	100-41-4	3	Yes/Vol	No	No	100 ppm	Colorless, flammable liquid with a pungent aromatic odor. Main points of attack include the eyes, upper respiratory system, skin, and the CNS. Symptoms of acute exposure include irritation of the eyes and mucous membranes, headaches, dermatitis, and narcosis. Chronic exposures can lead to kidney and lung disease, chronic respiratory disease and skin disease.
Mixed Xylenes	1330-20-7	2	Yes/Vol	No	No	100 ppm	Colorless flammable liquid which exists in three isomeric forms. Exposure to xylene vapors may cause irritation to the eyes, nose, and throat. Systemic effects associated with acute exposure to xylene vapors may include CNS depression and minor reversible effects upon liver and kidneys.
Lead	7439-92-1	3	No	No	No	0.05 mg/m^3	Toxic routes of exposure to lead are food, water, and air. It is an acute as well as a chronic toxicant. The toxic effects depend on the dose and the nature of the lead salt. Chronic toxic effects may arise from occupational exposure.

TABLE A-1
TOXICOLOGICAL AND PHYSICAL PROPERTIES OF COMPOUNDS OF POSSIBLE CONCERN

Compound	CAS #	Hazard[b]	Volatility[c]	Skin Absorption[d]	Carcinogen[e]	Exposure Limit[f]	
Cadmium	7440-43-9	3	No	No	Yes	0.01 mg/m^3	Cadmium attacks the respiratory system, blood, kidneys, and prostate. Inhalation may cause cough, chest tightness, dyspnea. It is considered a carcinogen.
Metals	varies	varies	No	No	varies	varies	Some are classified carcinogens, teratogens, or mutagens. Routes of exposure include inhalation and skin. Damages the kidneys and liver. May produce dermatitis.
Methyl Ethyl Ketone	78-93-3	3	Yes	Yes	No	200 ppm	Colorless liquid with an acetone odor. Moderately toxic by ingestion and skin absorption. Affects the peripheral and central nervous system. Is a strong irritant.
Anthracene	120-12-7	3	Yes	Yes	Yes	Not listed	Colorless crystals with violet fluorescence. A skin irritant and allergen. Combustible when exposed to heat, flame, or oxidizing material, and moderately explosive when exposed to flame.
Pyrene	129-00-0	3	Yes	Yes	Yes	Not listed	Colorless solid, solutions have a slight blue color. Inhalation of pyrene is poisonous. Moderately toxic by ingestion. Vapors cause eye irritation, excitement, and muscle contractions.
Fluoranthene	206-44-0	3	No	Yes	Yes	Not listed	Colorless solid. Poisonous if taken intravenously and moderately toxic by ingestion and skin contact. Combustible when exposed to heat or flame. When heated to decomposition, it emits acrid smoke and irritating fumes.
Phenathrene	85-01-8	3	Yes	Yes	Yes	Not listed	Moderately toxic through ingestion. It is a human skin photosensitizer. Combustible when exposed to heat or flame and can react vigorously with oxidizing materials.

TABLE A-1
TOXICOLOGICAL AND PHYSICAL PROPERTIES OF COMPOUNDS OF POSSIBLE CONCERN

Compound	CAS #	Hazard[b]	Volatility[c]	Skin Absorption[d]	Carcinogen[e]	Exposure Limit[f]	
Methylene Chloride	75-09-2	3	Yes	Yes	Yes	50 ppm	Nonflammable, colorless liquid with a pleasant aromatic odor. Inhalation of vapors and direct skin contact may cause a dry scaly dermatitis. The liquid and vapor are irritating to the eyes and upper respiratory tract at high concentrations.
Chrysene	218-01-9	3	No	Yes	Yes	Not listed	Confirmed carcinogen by skin contact. When heated to decomposition, it emits acrid smoke and fumes.

Notes:
a. CAS # - Chemical Abstracts System number.
b. Hazard Rating - Based on SAX Hazard Ratings
   1 = Indicates an LC50 of 500 - 5000 ppm; or the material is combustible or has some reactivity hazard.
   2 = Indicates an LC50 of 100 - 500 ppm; or the material is flammable or reactive.
   3 = Indicates an LC50 of below 100 ppm; or the material is explosive, highly flammable, or highly reactive.
c. Volatility Rating - based on vapor pressures at 20EC.
   VOL = compound with vapor pressure greater than 5 mm Hg
d. Skin Absorption - "Yes" indicates that the compound has significant skin penetration based on ACGIH 1995-1996 Threshold Limit Values (TLVs).
e. Carcinogen - "Yes" indicates that the compound is a confirmed or suspected human carcinogen by the IARC, NIOSH, NTP, EPA, or ACGIH.
f. Exposure Limit - TLVs for Chemical Substances and Physical Agents and Biological Exposure Indices, ACGIH 1995-1996

TABLE A-2a
PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES
(WORK UNIFORM)
(VALUES GIVEN IN ^{O}F WBGT)

	Work Load		
Work/Rest Regimen	Light	Moderate	Heavy
Continuous Work	86	80	77
75% Work - 25% Rest, each hour	87	82	78
50% Work - 50% Rest, each hour	89	85	82
25% Work - 75% Rest, each hour	90	88	86

TABLE A-2b
PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES
(ANY LEVEL OF PROTECTION)
(VALUES GIVEN IN EF WBGT)

	Work Load		
Work/Rest Regimen	Light	Moderate	Heavy
Continuous Work	80	74	71
75% Work - 25% Rest, each hour	81	76	72
50% Work - 50% Rest, each hour	83	79	76
25% Work - 75% Rest, each hour	84	82	80

TABLE A-3
THRESHOLD LIMIT VALUES WORK/WARM-UP SCHEDULE FOR FOUR-HOUR SHIFT

Air Temperature-Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind	
EC (approx.)	EF (approx.)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	
-26E to -28E	-15E to -19E	Normal	1	Normal	1	75 min	2	55 min	
-29E to -31E	-20E to -24E	Normal	1	75 min	2	55 min	3	40 min	
-32E to -34E	-25E to -29E	75 min	2	55 min	3	40 min	4	30 min	
-35E to -37E	-30E to -34E	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
-38E to -39E	-35E to -39E	40 min	4	30 min	5	Non-emergency work should cease			
-40E to -42E	-40E to -44E	30 min	5	Non-emergency work should cease					
-43E & below	-45E & below	Non-emergency work should cease							

TABLE A-4
MINIMUM LIGHTING REQUIREMENTS

Facility Name or Function	Intensity (foot candles)
Accessways	
- general indoor	5
- general outdoor	3
- exitways, walkways, ladders, stairs	10
Administrative areas (offices, drafting, meeting rooms, etc.)	50
Chemical laboratories	50
Construction areas	
- general indoor	5
- general outdoor	3
- tunnels and general underground work areas (minimum of 10 foot candles required at tunnel and shaft heading during drilling, mucking, and scaling)	5
Conveyor Routes	10
Docks and loading platforms	3
Elevators, freight and passenger	20
First aid stations and infirmaries	30
Maintenance, operating and construction areas	
- vehicle maintenance shop	30
- carpentry shop	10
- outdoors field maintenance area	5
- refueling area, outdoor	5
- shops, fine detail work	50
- shops, medium detail work	30
- welding shop	30
Mechanical/electrical equipment rooms	10
Parking areas	3
Toilets, wash and dressing rooms	10
Visitor areas	20
Warehouses and storage rooms and areas	
- stockrooms, active or bulk storage, indoors	10
- inactive storage, indoors	5
- rack storage, indoors	25
- outdoor storage	3
Work areas - general (not listed above)	30

TABLE A-5
MONITORING REQUIREMENTS

Type of Monitoring	Method of Monitoring	Location of Monitoring	Duration of Monitoring
Volatile Organic Compounds	Photoionization detector and/or flame ionization detector	Breathing zone of workers subject to the highest levels	Continuous during operations in trenches or excavations
Benzene	Detector tubes	Breathing zone of workers subject to the highest levels	When PID/FID readings exceed 5 ppm in the breathing zone
Lower Explosive Limit	Explosimeter	Breathing zone of workers subject to the highest levels	Continuous
Oxygen	Oxygen meter	Breathing zone of workers subject to the highest levels	Continuous
Hydrogen Sulfide	Hydrogen sulfide meter	Breathing zone of workers subject to the highest levels	Continuous
Respirable Dust	Real-time dust monitor	Breathing zone of workers subject to the highest levels	Continuous
Noise	Noise dosimeter and/or Sound level meter	Area and/or lapel of worker subject to the highest levels	Periodic with sound level meter Daily with dosimeter
Heat Stress	Wet Bulb Globe Thermometer Index (WBGT)	Area	Continuous
Cold Stress	Calibrated thermometer	Area	Continuous

TABLE A-6
REAL-TIME MONITORING ACTION LEVELS

Compound Monitored	Instrument	Action Level	Response Action
Organic Vapors	Photoionization detector and/or Flame ionization detector	Background to 5 ppm Above 5 ppm - 25 ppm > 25 ppm	Level D Level C Evacuate area and call PSHM
Benzene	Detector tubes	< 0.5 ppm > 0.5 ppm to 5 ppm > 5 ppm	Level D Level C Evacuate area and call PSHM
Dust	Respirable dust monitor	Background to 1mg/m^3 > 1 mg/m^3	Level D Level C & dust control
LEL	Explosimeter	<10 % >10 %	Level D Evacuate area or provide ventilation
Oxygen	Oxygen meter	< 19.5 % 19.5 to 23.5% >23.5%	Evacuate area and call PSHM Level D Evacuate area and call PSHM
Hydrogen Sulfide	Hydrogen sulfide meter	< 5 ppm > 5 ppm	Level D Evacuate area and call PSHM
Noise	Sound level meter	85 dBA	Hearing protection
Temperature Extremes	WBGT or Thermometer	See Tables A-2 and A-3	Work/rest regimen

Notes:
ppm = parts per million
mg/m^3 = milligrams per cubic meter
dBA = Decibels (A weighted)

TABLE A-7
LEVEL D/MODIFIED LEVEL D
PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

Route of Exposure	Protection Required	Type of PPE
Respiratory	No	
Head	Yes*	Hard Hat meeting ANSI Z89.1
Eyes	Yes	Safety glasses (with side shields) meeting ANSI Z87.1
Ears	Yes*	Hearing protectors with adequate Noise Reduction Rating (NRR) (at least 28 NRR)
Hands	Yes*	Leather or sturdy work gloves/chemical resistant gloves
Body	Yes	Chemical resistant coveralls for modified Level D
Feet	Yes	Work boots meeting ANSI Z41.1-75 (Steel toe and shank)

*As assigned by the SSHO, based on specific tasks and site conditions.

TABLE A-8
LEVEL C
PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

Route of Exposure	Protection Required	Type of PPE
Respiratory	Yes	Air purifying respirator with combination cartridge for 1,000 ppm organic vapors and dusts (HEPA)
Head	Yes	Hard hat meeting ANSI Z89.1
Eyes	Yes	Safety glasses (with side shields) meeting ANSI Z87.1
Ears	Yes*	Hearing protectors with adequate Noise Reduction Rating
Hands	Yes	Chemical resistant inner and outer gloves
Body	Yes*	Work uniform/chemical resistant coverall
Feet	Yes	Work boots meeting ANSI Z41.1-75

*As assigned by the SSHO, based on specific tasks and site conditions.

TABLE A-9
LEVEL B
PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

Route of Exposure	Protection Required	Type of PPE
Respiratory	Yes	Full-face SCBA/airline (with 5-minute escape bottle)
Head	Yes	Hard hat meeting ANSI Z89.1
Eyes	Yes	Full-face SCBA/airline respirator
Ears	Yes*	Hearing protectors with adequate Noise Reduction Rating
Hands	Yes	Chemical resistant inner and outer gloves
Body	Yes*	Work coverall/chemical resistant coverall
Feet	Yes	Work boots meeting ANSI Z41.1-75

*As assigned by the SSHO, based on specific tasks and site conditions.

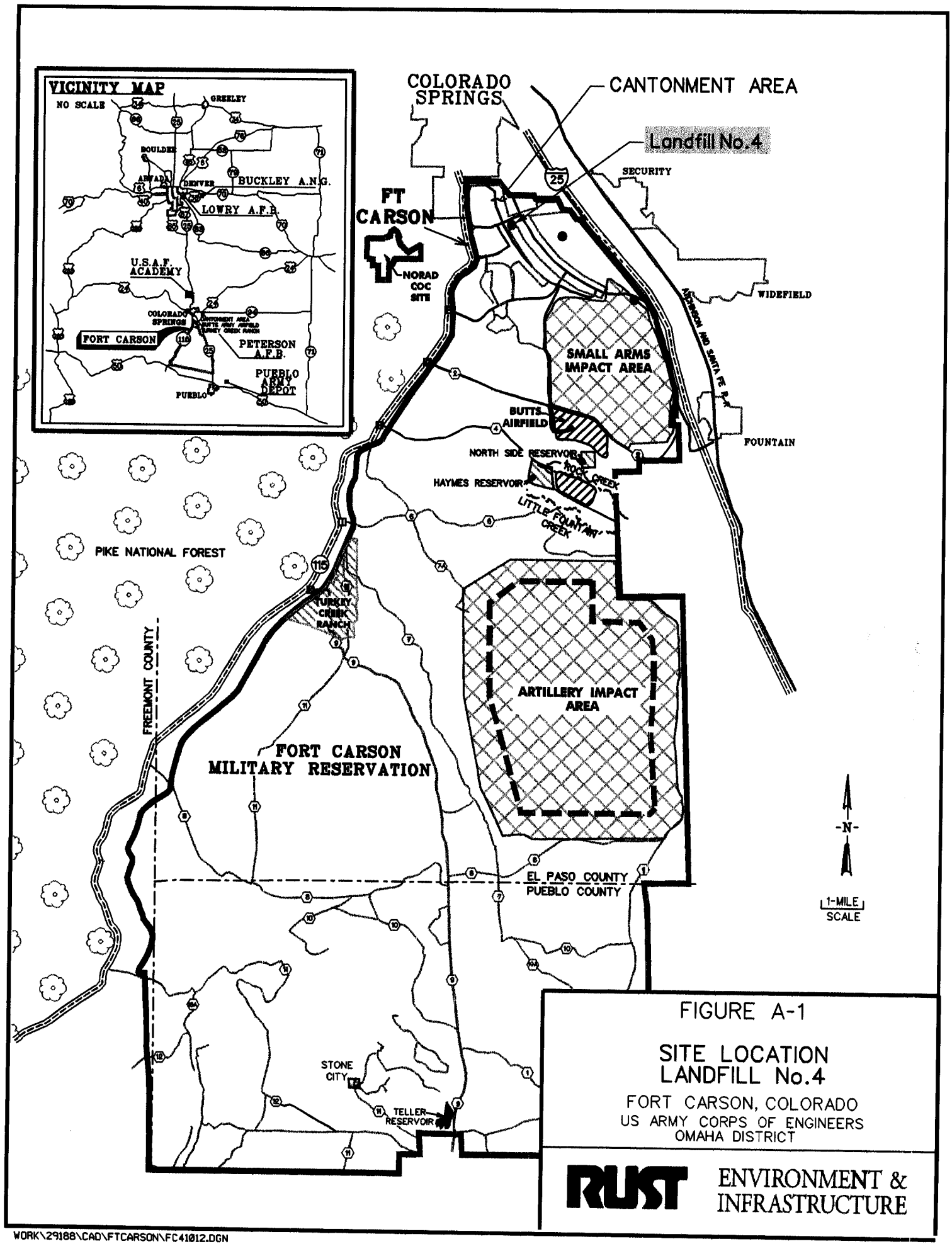


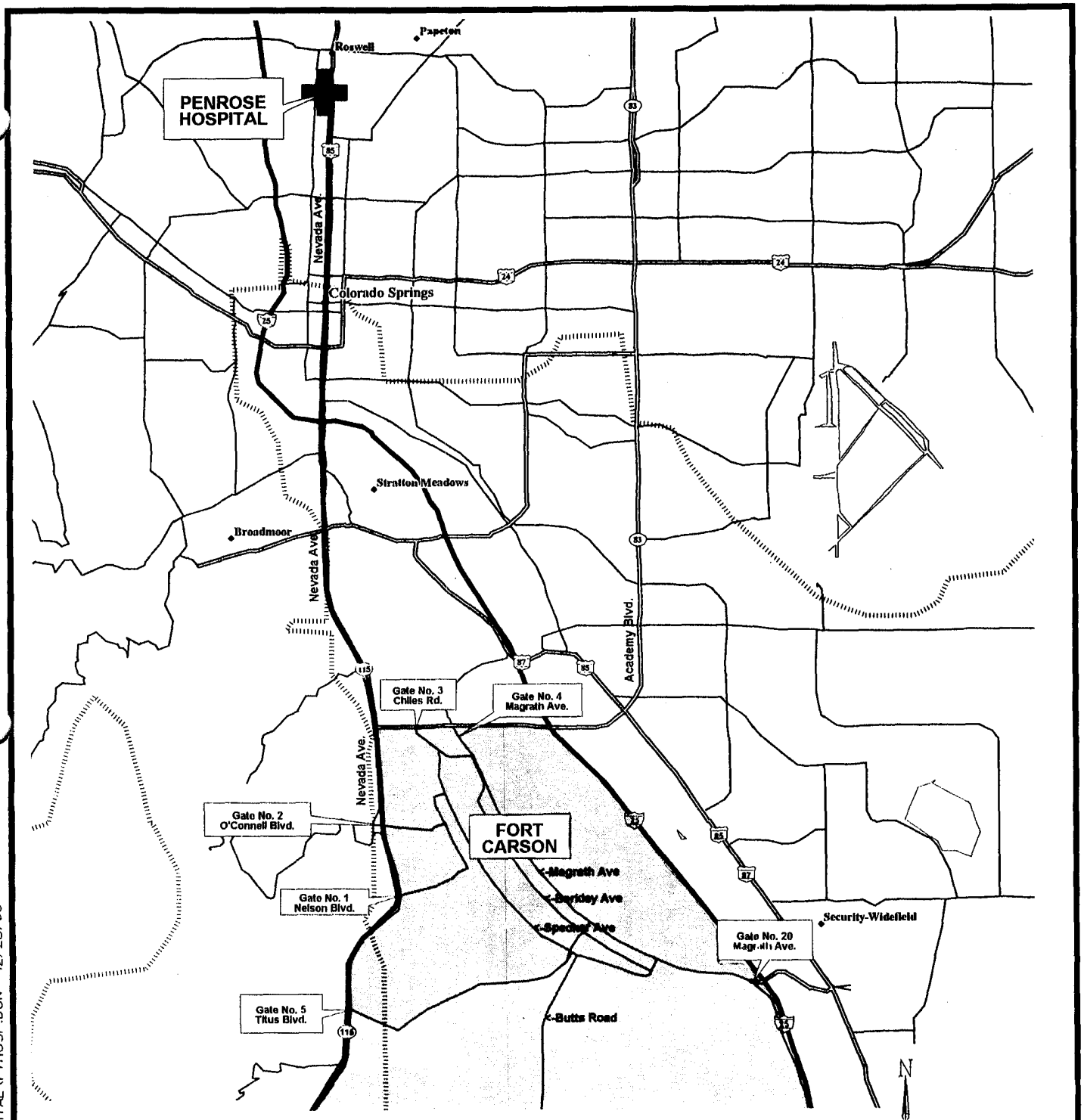
FIGURE A-1

SITE LOCATION
LANDFILL No.4

FORT CARSON, COLORADO
US ARMY CORPS OF ENGINEERS
OMAHA DISTRICT

RUST ENVIRONMENT & INFRASTRUCTURE

WORK\29188\CAD\FTCARSON\FC41012.DGN



LEGEND

PENROSE HOSPITAL
2215 N. CASCADE AVE.
COLORADO SPRINGS, CO 80907
(719) 630-5000

Contours

DIRECTIONS TO HOSPITAL:

FROM FORT CARSON TAKE HGWY 115 (S. NEVADA AVE). PROCEED NORTH 6.5 MILES TO JACKSON STREET. PROCEED WEST ON JACKSON 1.5 BLOCKS TO THE EMERGENCY ROOM ENTRANCE.

EARTH TECH

FIGURE A-2

ROUTE TO OFF-SITE HOSPITAL

FORT CARSON, COLORADO

L:\WORK\29188\CAD\FTCARSON\MICROSTA\HOSPITAL\FTHOSP.DGN 12/28/99

APPENDIX B

TEST PIT REPORTS

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-01

PROJECT: LF 4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST E&I
EQUIPMENT USED: OVM, MULTIGAS, DUST (310D JOHN DEERE)

JOB NO: 55253.000
LOCATION: WBS 00912
ELEVATION:
DATE START: 8/24/98
DATE FINISH: 8/24/98
LOGGED BY: SE GILLEY

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
2			SILT (ML) DRY, LIGHT BROWN (OLIVE 5Y 5/3) MOSTLY SILT, LITTLE TO FEW FINE SAND, NO ORANGE STAINING SOME WHITE DEPOSITS @ 2-3 FT	
4			RESIDUUM.	
6			CONTACT WEATHERED PIERRE SHALE SILT (ML) DRY TO MOIST, WEATHERED SILTSTONE OLIVE 5Y 5/3, HARD BLOCKY ORANGE STAINING ON FRACTURES	
8				
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
NE		

NOT ENCOUNTERED NE * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

20 FT (L) x 1.0 FT (W) x 7 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-02

PROJECT: LF4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST
EQUIPMENT USED: OVM, DUST MONITOR MULTIGAS 310D JOHN DEERE

JOB NO: 55253
LOCATION: LF4
ELEVATION: —
DATE START: 8/24/98
DATE FINISH: 8/24/98
LOGGED BY: J GILLESPIE

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
2			SILT(ML) RED/BROWN	
4			CONTACT WEATHERED PIERRE SHALE	▽ 4.8 FT
6			B.O.E. @ 5.1 FT	
8				
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/24/98	1325	4.8 FT.

NOT ENCOUNTERED ☐ * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10 (L) x 1.0 (W) x 5.0 (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4 TP03

0630 J. Henderson

PROJECT: LF4, 10, 11 INVESTIGATI
CLIENT: ~~USACE~~ USACE
CONTRACTOR: RUST E&I
EQUIPMENT USED: OVM, DUST MONITOR, MULTIGAS, 310D JOHN DEERE BACKHOE

JOB NO: 55253.000 20912
LOCATION: LF4
ELEVATION: —
DATE START: 8/24/98
DATE FINISH: 8/24/98
LOGGED BY: EGILLESPIE

DEPTH (FT)	SAMPLE NO/ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
2			GRAVELLY CLAY (GC) MOIST, SLIGHTLY PLASTIC, MOSTLY CLAY, SOME RED GRAVEL (ROAD BASE) TRACE CONSTRUCTION CONCRETE	
4			FILL MATERIAL	
6				
8			GRASS BLACK DECAYED ORGANICS, OLD SURFACE HORIZON @ 7 FT CLAY (CL) SLIGHTLY MOIST, PLASTIC (OLIVE 5Y 5/3), MOSTLY CLAY, FEW FINE - MED SAND NO INDICATION OF FILL MATERIAL OR CONSTRUCTION DEBRIS	
10			B.O.F. @ 9.5 FT BGS. WEATHERED PIERRE NOT ENCOUNTERED	

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/24/98	1500	NE

NOT ENCOUNTERED ☐ * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10 FT (L) x 1.0 FT (W) x 9.5 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4 TP04

PROJECT: LF4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST E&I
EQUIPMENT USED: OVM, FOXMONITOR, MULTIGAS, 310D JOHN DEERE BACKHOE

JOB NO: 55253000 0896
LOCATION: LF4
ELEVATION: -
DATE START: 8/24/98
DATE FINISH: 8/24/98
LOGGED BY: EGILLESPIE

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
2			GRAVELLY CLAY (GC), MOIST PLASTIC, RED/BROWN (ROAD BASE) CHUNKS OF CONCRETE - DEBRIS IS LESS THAN 5%	
			FILL MATERIAL	
			GRASS BLACK DECAYED ORGANICS OLD SURFACE HORIZON	
4			SILT (ML) OLIVE 5Y 5/3, MOIST, MOSTLY SILT LITTLE FINE SAND	
6				
			RESIDUAL	
8			CONTACT WEATHERED PIERRE, DRY-MOIST, BLOCKY OLIVE	WT
			B.O.F. @ 9.0 FT	
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/24/98	1515	9.0 FT

NOT ENCOUNTERED | * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

5 FT (L) x 1.0 FT (W) x 9.0 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE **TEST PIT REPORT**

TEST PIT NO. LF4-TP05

PROJECT: LF4, 10, 11 INVESTIGATION	JOB NO: 55253.00912
CLIENT: USAEE	LOCATION: LF4
CONTRACTOR: RUST E & I	ELEVATION: –
	DATE START: 8/24/98
EQUIPMENT USED: OVM, DUST MONITOR, MULTIGAS, JOHN DEERE 310 B	DATE FINISH: 8/24/98
	LOGGED BY: [illegible]

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
			LOW LYING AREA.	
			SILT (ML) MOIST, (OLIVE MOTTLED GRAY, 5Y 5/2) MOSTLY SILT, SLIGHTLY PLASTIC	
2			Fill MATERIAL	
4				
			SAND SP SATURATED, LOOSE, MOSTLY COARSE SILICA SAND, BACKFILL FOR WATER MAIN?	
6			B.O.E. @ 6.0 FT	▼ WL
			NOTE: MOVE 15 FT EAST & TRENCH LF4TP-06	
8				
10				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/24/98	1540	6.0 FT
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

5.0 FT (L) x 1.0 FT (W) x 6.0 FT (D) = ______ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. ______ = VOL. ______ CU. FT.

OVER 18 INCH DIAM: NO. ______ = VOL. ______ CU. FT.

TEST PIT NO. ______

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-06

PROJECT: LF 4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST E & I
EQUIPMENT USED: OVM, DUST MONITOR, MULTIGAS, 310D BACKHOE JOHN DEERE

JOB NO: 55253.009.00912
LOCATION: [illegible] 4
ELEVATION: —
DATE START: 8/24/98
DATE FINISH: 8/24/98
LOGGED BY: [illegible]

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
0			(W) SILT (ML) MOIST, PLASTIC, BLACK (S) ORGANICS GRASS	
2			GRAVELLY SILT (GM) MOIST - DRY ORANGE MOTTLED GRAY, MOSTLY SILT, SOME FINE ANGULAR GRAVEL, TRACE - FEW FINE SAND	
4			SILT (ML) MOIST - DRY, ORANGE MOTTLED GRAY, BLOCKY TEXTURE, SEVERELY WEATHERED PIERRE SHALE.	
6			8" PVC PIPE UNMARKED UTILITY	
8			B.O.E. @ 8 FT	▼
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/24/98	1600	8 FT.

NOT ENCOUNTERED | * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

5.0 FT (L) x 1.0 FT (W) x 8.0 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-07

PROJECT: LF4, 10, 11 LANDFILL INVESTIGATIONS
CLIENT: USACE
CONTRACTOR: REST E&E
EQUIPMENT USED: O/M, DUSTMONITOR, MULTIGAS, J. DEERE 18" BRKT 310D BACKHOE

JOB NO: 53253.000 LBS0912
LOCATION: DRMO STORAGE
ELEVATION: —
DATE START: 8/25/98
DATE FINISH: 8/25/98
LOGGED BY: EGILLESPIE

DEPTH (FT)	SAMPLE NO/ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
2		W	SILT (ML) MOIST - DRY, OLIVE 5Y 4/3, MOSTLY SILT SLIGHTLY PLASTIC, LITTLE TO FEW FINE SAND NO CONSTRUCTION DEBRI.	E TRENCH FROM E-W TOWARD DRMO STORAGE BLDG FROM B-DITCH
4			FILL	NOTE:
6			BLACK DECAYING ORGANICS (GRASS, VEGETATION) W/ BOULDERS CLAYSTONE, GRANITE SILT (ML) MOIST - SATURATED 5Y 6/6 OLIVE YELLOW, PLASTIC, MOSTLY SILT, LITTLE FINE SAND, NO CONSTRUCTION DEBRI	- OLD HORIZON LINE DROPS TO 8 FT BGS NEXT TO E END OF BLDG. NO VISIBLE WATER IN E END DOES NOT APPEAR TO BE AS SATURATED AS W. ▼ WATER SATURATION POINT BETWEEN 8-9 FT
8				
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	0945	8-9FT

NOT ENCOUNTERED ☐ * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

JEG 50 FT (L) x 18" (W) x 9.5 (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-08

PROJECT: LANDFILL 4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST
EQUIPMENT USED: OVM, DUST MONITOR, MULTIGAS, 310 D BACKHOE, 18" BUCKET

JOB NO: 5253.000 ABS 00912
LOCATION: SW CORNER DRMO
ELEVATION: —
DATE START: 8/25/98
DATE FINISH: 8/25/98
LOGGED BY: JE GILLESPIE

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
2			ML SILT (ML) MOIST, SLIGHT PLASTICITY, 5Y 3/3 OLIVE, MOSTLY SILT, 2 10" BOULDERS, LITTLE FINE TO MEDIUM SAND	
4			FILL	
6			BLACK DECAYING ORGANIC MATERIAL	~1.0 FT THICK GRASS, VEGETATION
8			SILT (ML) OLIVE YELLOW, 5Y 6/3, MOIST PLASTIC, MOSTLY SILT, LITTLE FINE SAND TRACE FINE GRAVEL	
10			B.O.E. @ 10 FT	▽ WATER ENTERING TRENCH

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	11:00	10.0FT

NOT ENCOUNTERED ☐ * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10FT (L) x 18" (W) x 10.0FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE

TEST PIT REPORT

TEST PIT NO. LF4TP-09a

PROJECT: LF4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST
EQUIPMENT USED: OVM, DETMONITOR, MULTIGAS, 310 D BACKHOE, 18" BUCKET

JOB NO: 55253.000 0091.2
LOCATION: SOF DRMO STORAGE
ELEVATION: —
DATE START: 8/25/98
DATE FINISH: 8/25/98
LOGGED BY: [illegible]

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
2			SILT(ML) MOIST, OLIVE (5Y 3/3), MOSTLY SILT, LITTLE - SOME FINE SAND, OCCASIONAL SAND LENSES ALLUVIAL CHANNEL>. OCCASIONAL TRACE COBBLES NO EVIDENCE OF LANDFILL ACTIVITIES	
4			FILL	
			BLACK DECAYING ORGANIC MATERIAL 6 - 8" THICK	NOTE: OLD HORIZON LINE
6			SILT (ML) MOIST SLIGHTLY PLASTIC OLIVE YELLOW 5Y 6/6, MOSTLY SILT,	
8				
10			CLOSE TO BEDROCK SEVERELY WEATHERED PIERRE AT 10 FT	
			Bottom of Exploration @ 10 FT	
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	1130	NE
NOT ENCOUNTERED		* HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

8FT (L) x 18" (W) x 10FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP09b @ 30 FT N.

PROJECT: LANDFILL 9, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST
EQUIPMENT USED: OVM, DUSTMONITER, MULTIGAS, 310D BACKHOE, 18" BUCKET

JOB NO: 55253.001 WBS CD912
LOCATION: S of DRMO STOR
ELEVATION: —
DATE START: 8/25/98
DATE FINISH: 8/25/98
LOGGED BY: JEG/LLS

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION (S. — N)	REMARKS
			(CL) DK GRAY, LANDFILL DEBRIS, DRY, MOSTLY CLAY, BRICK, WOOD, NAILS	1.0 FT THICK PINCHING OUT S. — LANDFILL DEBRIS
2			SILT (ML) BROWN, MOIST – DRY, MOSTLY SILT, FEW – LITTLE FINE GRAVEL, TRACE – COBBLES FILL	MISC SMALL METAL PIECES
4			FILL	
			BLACK ORGANIC DECAYING GRASS, VEGETATION ROOTS	— OLD SOIL HORIZON
6			SILT WITH SAND (ML) OLIVE (5Y 4/3), MOIST SLIGHTLY PLASTIC	
			BLACK ORGANIC ZONE	— OLD SOIL HORIZON
8			SILT (ML) MOIST – SATURATED, OLIVE YELLOW (5Y 6/6) SLIGHTLY PLASTIC, MOSTLY SILT, LITTLE FINE SAND.	
			RESIDUUM.	▼ VISIBLE WATER ENTERING PIT @ 9.0.
10			BOTTOM OF EXPLORATION @ 9.5 FT	
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	12:43	9.0 FT

NOT ENCOUNTERED ☐ * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

100 FT (L) x 18" (W) x 9 FT (D) = _____ CU. FT.

NOTE: PART TWO OF THREE REPORTS

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE

TEST PIT REPORT

TEST PIT NO. LFATP-09C
8 FT N ALONG TRENCH

PROJECT: LANDFILL 4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST
EQUIPMENT USED: OVM, DUST MONITOR, MULTIGAS, 310 D BACKHOE, 18" BUCKET

JOB NO: 55253.000 WBS 08912
LOCATION: 80 FT N OF 1 & 2
ELEVATION: —
DATE START: 8/25/98
DATE FINISH: 8/25/98
LOGGED BY: JEGILLESPIE

DEPTH (FT)	SAMPLE NO/ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
2			CLAY (CL) STIFF, DRY, CRUMBLY, DK GRAY, MOSTLY CLAY WITH SOME FINE - COARSE SAND, BROKEN BRICKS, NAILS, WOOD ~~GRAVEL~~ GRAVEL MISC. METAL CHUNKS. LANDFILL MAT.	
4			SANDY SILT WITH GRAVEL (ML) OLIVE (5Y 4/3), MOIST SLIGHTLY PLASTIC, MOSTLY SILT, SOME FINE TO COARSE SAND, LITTLE FINE GRAVEL, TRACE BOULDERS, COBBLES	
6				
8			FILL BLACK ORGANIC LAYER DECAYING VEGETATION B.O.E. @ 8 FT	▼ VISIBLE WATER ENTERING PIT @ 8 FT
10			NOTE. SEE LFATP-09 1, 1 & 2 LOCATIONS FOR DESCRIPTIONS OF MATERIAL BELOW BLACK ORGANICS	
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	1300	8.0 FT

NOT ENCOUNTERED ☐ * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

100 FT (L) x 18" (W) x 9.0 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-10

PROJECT: LANDFILL 4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST
EQUIPMENT USED: OVM, DUST MONITOR, MULTIGAS, 310 D BACKHOE 18" BUCKET

JOB NO: 55253.000 WBS 00912
LOCATION: S OF DRMO STORAGE
ELEVATION: —
DATE START: 8/25/98
DATE FINISH: 8/25/98
LOGGED BY: FERGUSON

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
2		~GS	E. GS. W. SILT (ML) MOIST, OLIVE (5Y 3/3), SOME FINE TO COARSE SAND, MOSTLY SILT, SOME GRAVEL, TRACE COBBLES, BOULDERS	DK GRAY CLAY WITH OLIVE YELLOW SILT
4			FILL	
6			BLACK ORGANIC LAYER, GRASS & VEGETATION	OLD SOIL HORIZON
8			B.O.E @ 6.5 - 7.0 FT @ BOT OF BLACK ORGANIC SOIL PROFILE	
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	1435	~~NE~~ JR
		NE

NOT ENCOUNTERED ☐ * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

55 FT (L) x 18" (W) x ~7FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-11

PROJECT: LANDFILL 4, 10, 11 INVESTIGAT
CLIENT: USACE
CONTRACTOR: RUST E & I
EQUIPMENT USED: OVM, DUSTMONITOR, MULTIGAS 18" BUCKET 330 D BACKHOE

JOB NO: 55253.000WS00912
LOCATION: SPOKANE RIVER
ELEVATION: —
DATE START: 8/25/98
DATE FINISH: 8/25/98
LOGGED BY: TG, LLS

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION (N.) (S.)	REMARKS
2			SILT (ML) OLIVE (5Y 4/3), MOIST, MOSTLY ~~SILT WITH SAND~~ SILT, LITTLE ~~SOME~~ FINE TO COARSE SAND, ~~FEW~~ FINE GRAVEL TRACE BOULDERS (2) AND COBBLES	
4			NOTE: NO EVIDENCE OF LANDFILL ACTIVITY	
6				
8			FILL	
10			BLACK ORGANIC LAYER	NOTE: LIMITS OF EQUIPMENT
12			B.O.E. @ 11 FT BELOW GROUND SURFACE	

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	1528	NE

NOT ENCOUNTERED | * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10 FT (L) x 18" (W) x 11 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-12

PROJECT: LF 4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST E & I
EQUIPMENT USED: OVM, DUSTMONITOR, MULTIGAS, 380-D BACKHOE, 18" BUCKET

JOB NO: 55253.000 WBS 00912
LOCATION: E OF DEMO STORAGE #8
ELEVATION: —
DATE START: 8/25/98
DATE FINISH: 8/25/98
LOGGED BY: JEGILLESPIE

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
0			TOP SOIL	
			SILT (ML) BLOCKY, DRY, OLIVE (5Y4/3), MOSTLY SILT, ORANGE STAINING @ 8FT	
2			WEATHERED PIERRE.	
4				
6				
8				▽ VISIBLE WATER ENTERING BORING FROM FRACTURES
10			B.O.E @ 10 FT IN WEATHERED PIERRE SHALE	
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	1600	8.5FT

NOT ENCOUNTERED ☐ * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10FT (L) x 18" (W) x 10FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-13

PROJECT: LF4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST E&I
EQUIPMENT USED: OVM, DUST MONITOR, MINIRAE, 330D BACKHOE, 18" BUCKET

JOB NO: 55253.000 WBS 009.12
LOCATION: NORTH DRMO STOR
ELEVATION: —
DATE START: 8/26/98
DATE FINISH: 8/26/98
LOGGED BY: EGILLES

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
			ROAD BASE 1.5FT 1/2" GRAVEL	
2			BROWN GRAVEL, BOULDERS, SAND, LOOSE, SATURATED, ALLUVIAL? FILL? VISIBLE WATER RUNNING ON FAR SIDES	NOTE FAR NORTH EDGE OF DRMO FAC
4			NO INDICATION OF LANDFILL ACTIVITY	▼ VISIBLE WATER @ 3.0 FT
6			CLAY (CL), SOFT, MOIST TO SATURATED, OLIVE (5Y 3/3), MOSTLY CLAY (ROLLS < 1/8") BLACK ORGANIC LAYER @ 5.0 THEN CLAY LAYER < 5 INCHES THICK RESIDUUM	
8			B.O.E. @ 7.0 FT DUE TO CAVE IN NO INDICATION OF LANDFILL ACTIVITIES	
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/26/98	0900	3.0FT

NOT ENCOUNTERED ☐ * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10FT (L) x 18" (W) x 7.0FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LFATP-14

PROJECT: LANDFILL 4/10/11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST E & I
EQUIPMENT USED: OVM, DUST MONITOR, MULTIGAS, 330D TRACK HOE 18" BUCKET

JOB NO: 55253.000 WBS 00912
LOCATION: CENTER GRAVEL ROAD
ELEVATION: -
DATE START: 8/26/98
DATE FINISH: 8/26/98
LOGGED BY: JEG/WEM

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
0			1/2" GRAVEL ROAD BASE TO 1.0 FT	
			3-4" STONE W/ CLAY BASE	
2			SILT (ML), MED. DENSE, OLIVE 5Y 3/3, DRY, MOSTLY SILT, LITTLE FINE SAND, BLOCKY FRACTURE, LAMINATED, WHITE PRECIPITATE ALONG FRACTURE	
			BECOMING DENSE W/ DEPTH	
4				
			WEATHERED PIERRE SHALE	
6				
			BOTTOM OF EXPLORATION @ 6.5 FT IN WEATHERED PIERRE SHALE	NOTE: DIFFICULT EXCAVATION @ 6.5 USING WEIGHT OF BACKHOE TO BREAK UP.
8				
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/26/98	0945	NE

NOT ENCOUNTERED ☐ * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10 FT (L) x 18" (W) x 6.5 FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE

TEST PIT REPORT

TEST PIT NO. LF4TP-15

PROJECT: LF4, 10, 11 INVESTIGATN
CLIENT: USACE
CONTRACTOR: RUST E & I
EQUIPMENT USED: OVM, DUST MONITOR, MULTIGAS, 330D BACKHOE, 18 INCH BUCKET

JOB NO: 55253.000 WBS 00912
LOCATION: SW CORNER DRMO GRAVEL
ELEVATION: —
DATE START: 8/26/98
DATE FINISH: 8/26/98
LOGGED BY: EG, LLEE

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
2			CRUSHER RUN ROAD BASE MATERIAL SILT w/ SAND (SM) SOFT, OLIVE (5Y 4/3), MOSTLY SILT, LITTLE FINE TO COARSE SAND, BROKEN CHUNKS OF DK GRAY WEATHERED DIGITAL SHALE	NE OF LF4-MW1 ≈ 50 FT
4			FILL MATERIAL	
6			B.O.E. @ 4.5 FT IN WOOD DEBRI	
8				
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/26/98	10:30	NE

NOT ENCOUNTERED | * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

15' (L) x 18" (W) x 4.5' (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE

TEST PIT REPORT

TEST PIT NO. LF4TP-16

PROJECT: LF4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST E & I
EQUIPMENT USED: OVM, DUSTMONITOR, MULTIGAS, 330D EXCAVATOR, 18 INCH BUCKET

JOB NO: 55253.000 WBS 009.12
LOCATION:
ELEVATION:
DATE START: 8/26/98
DATE FINISH: 8/26/98
LOGGED BY: [illegible]

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
0			1/2" GRAVEL ROAD BASE	
2			SILT (ML). DENSE, OLIVE (5Y 4/3), MOSTLY SILT, LITTLE FINE SAND, WHITE PRECIPITANT ON BLOCKY FRACTURE SURFACES, SLIGHTLY LAMINATED.	NO GROUNDWATER ENCOUNTERED
4			NOTE: BECOMING DENSER W/ DEPTH	
			NO LANDFILL ACTIVITY ENCOUNTERED	WEATHERED PIERRE SHALE
6			B.O.E. @ 5.0 FT BGS IN DK GREENISH GRAY WEATHERED PIERRE SHALE.	
8				
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/26/98	1056	NE

NOT ENCOUNTERED | * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10FT (L) x 18" (W) x 5.0FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE

TEST PIT REPORT

TEST PIT NO. LF4TP-17

PROJECT: LF4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: RUST E&I
EQUIPMENT USED: OVM, DUSTMONITOR, MULTIGAS, 380D BACKHOE, 18" BUCKET

JOB NO: 55253.000 WBS 009.12
LOCATION: E. BDRy Fence
ELEVATION: —
DATE START: 8/26/98
DATE FINISH: 8/26/98
LOGGED BY: [illegible]

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
2			1/2" ROAD BASE MATERIAL SILT (ML) MEDIUM – DENSE, DRY, OLIVE 5Y 4/3, WHITE PRECIPITATE ALONG FRACTURES SLIGHTLY LAMINATED, MOSTLY SILT, LITTLE FINE – MEDIUM SAND	
4			WEATHERED PIERRE SHALE	
6			B.O.E. @ 5FT BECOMING DIFFICULT TO EXCAVATE NO INDICATION OF LAND FILL ACTIVITY	
8				
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/26/98	1133	NE

NOT ENCOUNTERED | * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

10FT (L) x 18" (W) x 5FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

ENVIRONMENT & INFRASTRUCTURE

TEST PIT REPORT

TEST PIT NO. LF4TP-18

PROJECT: LANDFILL 4, 10, 11 INVESTIGATION
CLIENT: USACE
CONTRACTOR: PARKER EXCAVATION
EQUIPMENT USED: CAT 330 L TRACHOE OVM DUST MONITOR

JOB NO: 55253.000 00912
LOCATION: LF4TP-03
ELEVATION: —
DATE START: 8/31/98
DATE FINISH: 8/31/98
LOGGED BY: SEGILVEY

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
4			SAND SILT (ML) MEDIUM, DRY, BROWNISH YELLOW 10YR 5/8 MOTTLED OLIVE GRAY 5Y 4/2, MOSTLY SILT, SOME FINE TO COARSE SAND, TRACE COBBLES BOULDERS, CONCRETE MANHOLE, MISC. WIRE — FILL	
8			SILT (ML) MOIST, MEDIUM, OLIVE 5Y 4/3, MOSTLY SILT LITTLE FINE SAND	OLD HORIZON LINE
12			SEVERELY WEATHERED PIERRE	▼ VISIBLE WATER ENTERING THE PIT @ 12 FT
16			SILT (ML) MEDIUM DENSE, MOIST, OLIVE 5Y 4/3 MOTTLED OLIVE GRAY. MOSTLY SILT, SOME FINE SAND, BLOCKY TEXTURE, IRON STAINING SLIGHTLY LAMINATED	12 FT CONTACT W/WEATHERED PIERRE
20			WEATHERED PIERRE SHALE	
			B.O.E @ 20 FT	
24				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/31/98	1520	12FT

NOT ENCOUNTERED ☐ * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

15FT (L) x 3FT (W) x 20FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

IST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-19

PROJECT: LANDFILL 4, 10, 11 INVESTIGATIO
CLIENT: USACE
CONTRACTOR: PARKER EXCAVATING
EQUIPMENT USED: CAT 330 L TRACHOE OVM DUST MONITOR

JOB NO: 55253.000 0E912
LOCATION: LF4TP-04
ELEVATION: —
DATE START: 8/31/98
DATE FINISH: 8/31/98
LOGGED BY: E. GILLESPIE

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
4			SILT WITH SAND (ML) MEDIUM, MOIST-DRY, ORANGE RED MOTTLED OLIVE 5Y 4/3, MOSTLY SILT WITH SOME SAND, LITTLE RED GRAVEL LENS - W/ SMALL AMOUNT OF CONCRETE	
			FILL	
8			SILT (ML) MEDIUM, OLIVE, 5Y 4/3, MOIST, MOSTLY SILT LITTLE FINE SAND	BLACK ORGANICS GRASS ROOTS FORMER HORIZON
			RESIDUUM SEVERELY WEATHERED PIERRE	
12				CONTACT WEATHERED PIERRE
			SILT (ML) MEDIUM DENSE, MOIST, OLIVE (5Y 4/3), MOSTLY SILT, LITTLE FINE SAND, BLOCKY TEXTURE, SLIGHTLY LAMINATED ORANGE STAINING ON FRACTURE SURFACES	
16			WEATHERED PIERRE.	
			B.O.E. @ 18FT	
20				
24				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/31/98	1541	NF

NOT ENCOUNTERED | * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

15FT (L) x 3FT (W) x 18FT (D) = _____ CU. FT.

BOULDERS

12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

RUST ENVIRONMENT & INFRASTRUCTURE TEST PIT REPORT

TEST PIT NO. LF4TP-07

PROJECT: LF4, 10, 11 LANDFILL INVESTIGATIONS
CLIENT: USACE
CONTRACTOR: REST E3T
EQUIPMENT USED: OVM, DUSTMONITER, MULTIGAS, J. DEERE 18" BRUSH 310 D BACKHOE

JOB NO: 53253.000 LS1009712
LOCATION: DRMO STORAGE
ELEVATION: -
DATE START: 8/25/98
DATE FINISH: 8/25/98
LOGGED BY: JEG/LLB/RA

DEPTH (FT)	SAMPLE NO./ DEPTH RANGE	STRATA CHANGE (FT)	FIELD CLASSIFICATION	REMARKS
2		W	SILT (ML) MOIST - DRY, OLIVE 5Y 4/3 MOSTLY SILT SLIGHTLY PLASTIC, LITTLE TO FEW FINE SAND NO CONSTRUCTION DEBRI	E TRENCH FROM W - E TOWARD DRMO STORAGE BLDG FROM B-DITCH
4			FILL	NOTE: ~~DRY~~ - OLD HORIZON LINE DRYS TO 8 FT BGS NEXT TO E END OF BLDG. NO VISIBLE WATER IN E END DOES NOT APPEAR TO BE AS SATURATED AS W. ▼ WATER SATURATION POINT BETWEEN 8-9 FT
6			BLACK DISCOLORATION ORGANICS (GRASS, VEGETATION) W/ BOULDERS CLAYSTONE, GRANITE SILT (ML) MOIST - SATURATED 5Y 6/6 OLIVE YELLOW, PLASTIC, MOSTLY SILT, LITTLE FINE SAND, NO CONSTRUCTION DEBRI	
8				
10				
12				

ASTM COMPONENT %

MOSTLY	50 - 100 %
SOME	30 - 45 %
LITTLE	15 - 25 %
FEW	5 - 10 %
TRACE	< 5 %

GROUND WATER

DATE	TIME *	DEPTH FT.
8/25/98	0945	8-9FT

NOT ENCOUNTERED ☐ * HRS. AFTER COMPLETION

PIT DIMENSIONS (FT)

JEG 50 FT (L) x 18' (W) x 9.5 (D) = _____ CU. FT.

BOULDERS

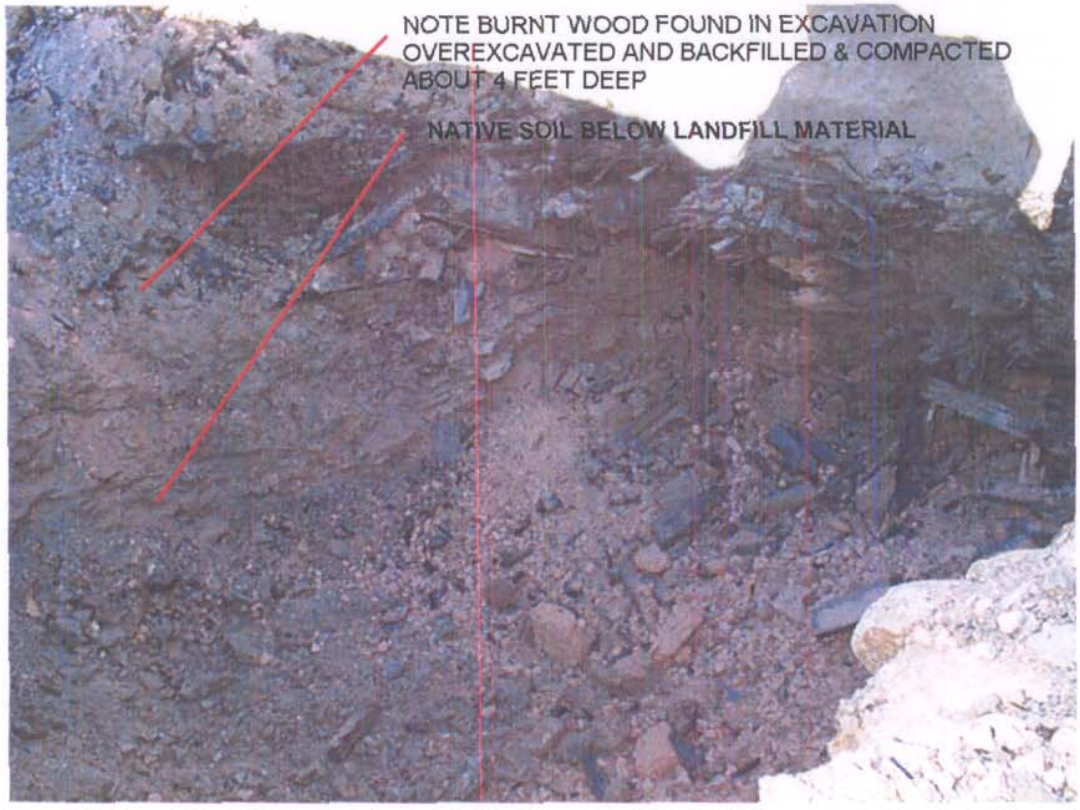
12 INCH TO 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.
OVER 18 INCH DIAM: NO. _____ = VOL. _____ CU. FT.

TEST PIT NO. _____

APPENDIX C

SITE PHOTOS


NOTE UNSUITABLE SUBSOIL UNCOVERED DURING
EXCAVATION APPROX 15 NOV 1999 KEN WRIGHTSMAN
STEVE BELLO AGREED TO OVEREXCAVATE AND INSTALL
ENGINEERED FILL AT EAST COLUMN FOOTINGS


NOTE BURNT WOOD FOUND IN EXCAVATION
OVEREXCAVATED AND BACKFILLED & COMPACTED
ABOUT 4 FEET DEEP
NATIVE SOIL BELOW LANDFILL MATERIAL


NOTE NEW GAS LINE INSTALL WITH
SHUT OFF AT SAME TIME AS MOD
TO RELOCATE EXISTING LINE TO
THE WEST OF SITE